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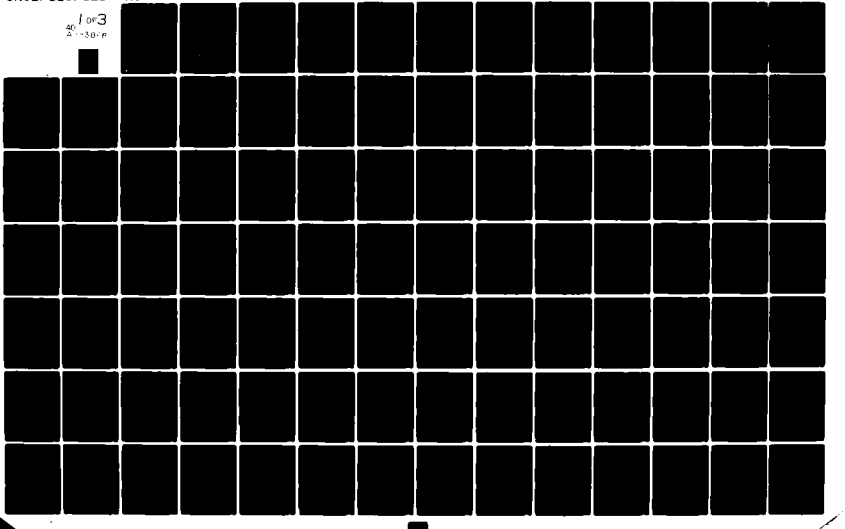

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This manual documents the use and simple customization of the display editor EMACS with the Twenex (Officially known as "TOPS-20) operating system. The reader is not expected to be a programmer. Even simple customizations do not require programming skill, but the user who is not interested in customizing can ignore the scattered customization hints. This is primarily a reference manual, but can also be used as a primer.

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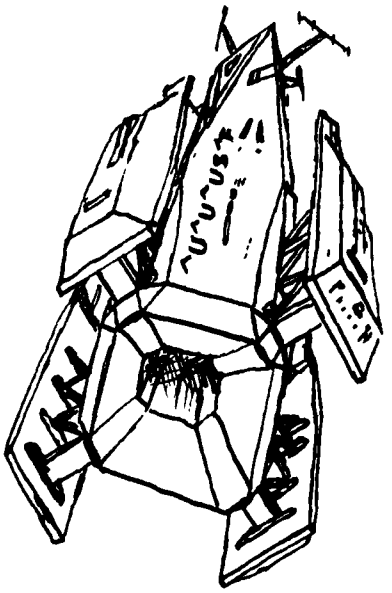

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EMACS Manual for TWENEX Users

by

Richard M. Stallman

A reference manual

for the extensible, customizable, self-documenting

real-time display editor

This manual corresponds to EMACS version 150

This report describes work done at the Artificial Intelligence Laboratory of the Massachusetts Institute of Technology. Support for the laboratory's research is provided in part by the Advanced Research Projects Agency of the Department of Defense under Office of Naval Research contract N00014-75-C-0643.

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Preface

This manual documents the use and simple customization of the display editor EMACS with the Twenex (officially known as "TOPS-20") operating system. The reader is *not* expected to be a programmer. Even simple customizations do not require programming skill, but the user who is not interested in customizing can ignore the scattered customization hints.

This is primarily a reference manual, but can also be used as a primer. However, I recommend that the newcomer first use the on-line, learn-by-doing tutorial TEACH-EMACS. With it, you learn EMACS by using EMACS on a specially designed file which describes commands, tells you when to try them, and then explains the results you see. This gives a more vivid introduction than a printed manual.

On first reading, you need not make any attempt to memorize chapters 1 and 2, which describe the notational conventions of the manual and the general appearance of the EMACS display screen. It is enough to be aware of what questions are answered in these chapters, so you can refer back when you later become interested in the answers. After reading the Basic Editing chapter you should practice the commands there. The next few chapters describe fundamental techniques and concepts that are referred to again and again. It is best to understand them thoroughly, experimenting with them if necessary.

To find the documentation on a particular command, look in the index if you know what the command is. If you know vaguely what the command does, look in the command index. The command index contains a line or two about each command, and a cross-reference to the section of the manual that describes the command in more detail; related commands are grouped together. There is also a glossary, with a cross reference for each term.

The manual is available in three forms: the published form, the LPT form, and the INFO form. The published form is printed by the Artificial Intelligence lab. The LPT form is available on line for printing on unsophisticated hard copy devices such as terminals and line printers. The INFO form is for on-line perusal with the INFO program. All three forms are substantially the same. There are also two versions of the text: one for use with ITS, MIT's Incompatible Timesharing System, and one for use with Twenex. Both versions are available in all three forms.

EMACS is available for distribution for use on Tenex and Twenex systems (It does not run on Bottoms-10, and the conversion would not be easy). Mail us a 2400 foot mag tape if you want it. It does not cost anything; instead, you must join the EMACS software-sharing commune. The conditions of membership are that you must send back any improvements you make to EMACS, including any libraries you write, and that you must not redistribute the system except exactly as you got it, complete. (You can also distribute your customizations, *separately*.) It is pathetic to hear from sites

that received incomplete copies lacking the sources, asking me years later whether sources are available.

For information on the underlying philosophy of EMACS and the lessons learned from its development, write to me for a copy of AI memo 519, "EMACS, the Extensible, Customizable Self-Documenting Display Editor", or send Arpanet mail to RMS@MIT-AI.

Yours in hacking,

```
 /  2 \ 1/2
<  X   >
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```

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Introduction

You are about to read about EMACS, an advanced, self-documenting, customizable, extensible real-time display editor.

We say that EMACS is a display editor because normally the text being edited is visible on the screen and is updated automatically as you type your commands. See section 1 [Display], page 5.

We call it a real-time editor because the display is updated very frequently, usually after each character or pair of characters the user types. This minimizes the amount of information you must keep in your head as you edit. See section 3 [Basic], page 13.

We call EMACS advanced because it provides facilities that go beyond simple insertion and deletion: filling of text; automatic indentation of programs; viewing two files at once; and dealing in terms of characters, words, lines, sentences, paragraphs, and pages, as well as expressions and comments in several different programming languages. It is much easier to type one command meaning "go to the end of the paragraph" than to find the desired spot with repetition of simpler commands.

Self-documenting means that at any time you can type a special character, the "Help" key, to find out what your options are. You can also use it to find out what any command does, or to find all the commands that pertain to a topic. See section 7 [Help], page 31.

Customizable means that you can change the definitions of EMACS commands in little ways. For example, if you use a programming language in which comments start with /** and end with **/, you can tell the EMACS comment manipulation commands to use those strings. Another sort of customization is rearrangement of the command set. For example, if you prefer the four basic cursor motion commands (up, down, left and right) on keys in a diamond pattern on the keyboard, you can have it. See section 21.8 [Customization], page 106.

Extensible means that you can go beyond simple customization and write entirely new commands, programs in the language TECO. EMACS is an "on-line extensible" system, which means that it is divided into many functions that call each other, any of which can be redefined in the middle of an editing session. Any part of EMACS can be replaced without making a separate copy of all of EMACS. Many already written extensions are distributed with EMACS, and some (including DIRED, PAGE, PICTURE, SORT, TAGS, and WORDAB) are documented in this manual. Although only a programmer can write an extension, anybody can use it afterward.

Extension requires programming in TECO, a rather obscure language. If you are clever and bold, you might wish to learn how. See the file INFO:CONV.INFO, for advice on learning TECO. This manual does not even try to explain how to write TECO programs, but it does contain some notes that are useful primarily to the extension writer.

Chapter One

The Organization of the Screen

EMACS divides the screen into several areas, each of which contains its own sorts of information. The biggest area, of course, is the one in which you usually see the text you are editing. The terminal's cursor usually appears in the middle of the text, showing the position of *point*, the location at which editing takes place. While the cursor appears to point *at* a character, point should be thought of as *between* two characters; it points *before* the character that the cursor appears on top of. Terminals have only one cursor, and when output is in progress it must appear where the typing is being done. This does not mean that point is moving. It is only that EMACS has no way to show you the location of point except when the terminal is idle.

The top lines of the screen are usually available for text but are sometimes pre-empted by an *error message*, which says that some command you gave was illegal or used improperly, or by *typeout* from a command (such as, a listing of a file directory). Error messages are typically one line, end with a question mark, and are accompanied by ringing the bell. Typeout generally has none of those characteristics.

The error message or typeout appears there for your information, but it is not part of the file you are editing, and it goes away if you type any command. If you want to make it go away immediately but not do anything else, you can type a Space. (Usually a Space inserts itself, but when there is an error message or typeout on the screen it does nothing but get rid of that.) The terminal's cursor always appears at the end of the error message or typeout, but this does not mean that point has moved. The cursor moves back to the location of point after the error message or typeout goes away.

If you type a question mark when an error message is on the screen, you enter the EMACS error handler. You probably don't want to do this unless you know how to write TECO programs. Enough said.

A few lines at the bottom of the screen compose what is called the *echo area*. *Echoing* means printing out the commands that you type. EMACS commands are usually not echoed at all, but if you pause for more than a second in the middle of a multi-character command then all the characters typed so far are echoed. This is intended to *prompt* you for the rest of the command. The rest of the command is echoed, too, as you type it. This behavior is designed to give confident users optimum response, while giving hesitant users information on what they are doing.

EMACS also uses the echo area for reading and displaying the arguments for some commands, such as searches, and for printing brief information in response to certain commands.

The line above the echo area is known as the *mode line*. It is the line that usually starts with "EMACS (something)". Its purpose is to tell what is going on in the EMACS, and to show any reasons why commands may not be interpreted in the standard way. The mode line is very important, and if you are surprised by how EMACS reacts to your commands you should look there for enlightenment.

1.1. The Mode Line

The normal situation is that characters you type are interpreted as EMACS commands. When this is so, you are at *top level*, and the mode line has this format:

```
EMACS  (major minor)  bfr:  file --pos-- *
```

major is always the name of the *major mode* you are in. At any time, EMACS is in one and only one of its possible major modes. The major modes available include Fundamental mode (which EMACS starts out in), Text mode, Lisp mode, PASCAL mode, and others. See section 20.1 [Major Modes], page 87, for details of how the modes differ and how to select one. Sometimes the name of the major mode is followed immediately with another name inside square-brackets ("[-]"). This name is called the *submode*. The submode indicates that you are "inside" of a command that causes your editing commands to be changed temporarily, but does not change *what* text you are editing. A submode is a kind of recursive editing level. See section 6.2 [Submodes], page 26.

minor is a list of some of the *minor modes* that are turned on at the moment. "Fill" means that Auto Fill mode is on. "Save" means that Auto-saving is on. "Save(off)" means that Auto-saving is on in general but momentarily turned off (it was overridden the last time a file was selected). "Atom" means that Atom Word mode is on. "Abbrev" means that Word Abbrev mode is on. "Ovwrt" means that Overwrite mode is on. See section 22.1 [Minor Modes], page 107, for more information. "Def" means that a keyboard macro is being defined; although this is not exactly a minor mode, it is still useful to be reminded about. See section 22.8 [Keyboard Macros], page 119.

bfr is the name of the currently selected *buffer*. Each buffer has its own name and holds a file being edited; this is how EMACS can hold several files at once. But at any time you are editing only one of them, the *selected* buffer. When we speak of what some command does to "the buffer", we are talking about the currently selected buffer. Multiple buffers make it easy to switch around between several files, and then it is very useful that the mode line tells you which one you are editing at any time. However, before you learn how to use multiple buffers, you will always be in the buffer called "Main", which is the only one that exists when EMACS starts up. If the name of the buffer is the same as the first name of the file you are visiting, then the buffer name is left out of the mode line. See section 14 [Buffers], page 67, for how to use more than one buffer in one EMACS.

file is the name of the file that you are editing. It is the last file that was visited in the buffer you are in. If "(RO)" (for "read only") appears after the filename, it means that if you visit another file in the same buffer then changes you have made to this file will be lost unless you have explicitly asked to save them. See section 13.1 [Visiting], page 57, for more information. If there is no "(RO)" and you visit another file in the same buffer, EMACS will offer to save your changes first, if there are any changes.

The star at the end of the mode line means that there are changes in the buffer that have not been saved in the file. If the file has not been changed since it was read in or saved, there is no star.

pos tells you whether there is additional text above the top of the screen, or below the bottom. If your file is small and it is all on the screen, --pos-- is omitted. Otherwise, it is --TOP-- if you are looking at the beginning of the file, --BOT-- if you are looking at the end of the file, or --nn%-- where nn is the percentage of the file above the top of the screen.

Sometimes you will see --MORE-- instead of --nn%--. This happens when typeout from a command is too long to fit on the screen. It means that if you type a Space the next screenful of information will be printed. If you are not interested, typing anything but a Space will cause the rest of the output to be discarded. Typing a Rubout will discard the output and do nothing else. Typing any other command will discard the rest of the output and also do the command. When the output is discarded, "FLUSHED" is printed after the --MORE--.

So much for what the mode line says at top level. When the mode line doesn't start with "EMACS", and doesn't look anything like the breakdown given above, then EMACS is not at top level, and your typing will not be understood in the usual way. This is because you are inside a subsystem, such as INFO (See section 6.1 [Subsystems], page 25.), or in a recursive editing level, such as Edit Options (See section 6.2 [Recursive Editing], page 26.). The mode line tells you what command you are inside.

In particular, if the mode line begins with a bracket "[" or a parenthesis "(", you are inside a recursive editing level or a minibuffer (See section 23 [Minibuffer], page 123.).

If you are accustomed to other display editors, you may be surprised that EMACS does not always display the page number and line number of point in the mode line. This is because the text is stored in a way that makes it difficult to compute this information. Displaying them all the time would be too slow to be borne. When you want to know the page and line number of point, you must ask for the information with the M-X What Page command. See section 18 [Pages], page 79. However, once you are adjusted to EMACS, you will rarely have any reason to be concerned with page numbers or line numbers.

Chapter Two

Character Sets and Command Input Conventions

In this chapter we introduce the terminology and concepts used to talk about EMACS commands. In particular, EMACS is designed for a kind of keyboard with two special shift keys which can type 512 different characters, instead of the 128 which ordinary ASCII keyboards can send.

2.1. The 9-bit Command Character Set

EMACS is designed ideally to be used with terminals whose keyboards have a pair of shift keys, labelled "Control" and "Meta", either or both of which can be combined with any character that you can type. These shift keys produce *Control* characters and *Meta* characters, which are the editing commands of EMACS. Ordinary characters like "A" which are neither Control nor Meta are used for inserting text. We name each of these characters by prefixing "Control-" or "Meta-" (abbreviated "C-" and "M-") to the character: thus, Meta-F or M-F is the character which is F typed with the Meta key held down. Control in the EMACS command character set is not precisely the same as Control in the ASCII character set, but the general purpose is the same.

The 128 characters, multiplied by the four possibilities of the Control and Meta keys, make 512 characters in the EMACS command character set. So it is called the 512-character set to distinguish it from ASCII, which has only 128 characters. It is also called the *9-bit* character set because 9 bits are required to express a number from 0 to 511. Note that the 512-character set is used only for keyboard commands. Characters in files being edited with EMACS are ASCII characters.

Sadly, most terminals do not have ideal EMACS keyboards. In fact, the only ideal keyboards are at MIT, so yours is certain not to be ideal. On nonideal keyboards, the Control key is somewhat limited (it can only be combined with some characters, not with all), and the Meta key may not exist at all. We make it possible to use EMACS on a nonideal terminal by providing two-character circumlocutions, made up of characters that you can type, for the characters that you can't type. These circumlocutions start with a *bit prefix* character; see below. Also see the appendix for more detailed information on what to do on your type of terminal.

It may seem an unfortunate coincidence that both the EMACS 9-bit character set and the ASCII character set use the term "Control" for not exactly the same thing.

This came about because the 9-bit character set was invented by generalizing ASCII. In ASCII, only letters and a few punctuation marks can be made into Control characters; we wanted to have a Control version of every character. For example, we have Control-Space, Control-digits, and Control-=. We also have Control-A and Control-a which are two different characters; however, all such pairs have the same meaning as EMACS commands, so you can forget about this quirk of the character set unless you begin customizing. In practice, you can forget all about the distinction between ASCII Control and EMACS Control, except to realize that EMACS uses some "Control" characters which are not on your keyboard.

In addition to the 9-bit command character set, there is one extra character called Help. It cannot be combined with Control or Meta. Its use is to ask for documentation, at any time. Like the 9-bit characters, the Help character has its own key on an ideal keyboard, but must be represented by something else on other keyboards. The usual choice is Control-Underscore, code 337 (octal). What this means is that the 9-bit character Control-Underscore cannot be used because it is translated to Help instead. The code used internally for Help is 4110 (octal).

We have given some command characters special names which we always capitalize. "Return" or "<cr>" stands for the carriage return character, code 015 (all character codes are in octal). Note that C-R means the character Control-R, never Return. "Rubout" is the character with code 177, labeled "Delete" on some keyboards. "Altmode" is the character with code 033, sometimes labeled "Escape". Other command characters with special names are Tab (code 011), Backspace (code 010), Linefeed (code 012), Space (code 040), Excl ("!", code 041), Comma (code 054), and Period (code 056). Control is represented in the numeric code for a character by 200, and Meta by 400; thus, Meta-Period is code 456 in the 9-bit character set.

2.2. Prefix Characters

A non-ideal keyboard can only send certain Control characters, and may completely lack the ability to send Meta characters. To use these commands on such keyboards, you need to use two-character circumlocutions starting with a *bit prefix* character which turns on the Control or Meta bit in the second character. The Altmode character turns on the Meta bit, so Altmode X can be used to type a Meta-X, and Altmode Control-O can be used to type a C-M-O. Altmode is known as the *Metizer*. Other bit prefix characters are C-^ for Control, and C-Z for Control and Meta together. Thus, C-^ < is a way of typing a Control-<, and C-Z < can be used to type C-M-<. Because C-^ is awkward to type on most keyboards, we have tried to minimize the number of commands for which you will need it.

The bit prefix characters are simply commands which run the functions ^R Prefix Control, ^R Prefix Meta, and ^R Prefix Control Meta.

There is another prefix character, Control-X which is used as the beginning of a large set of two-character commands known as *C-X commands*. C-X is not a bit prefix character; C-X A is not a circumlocution for any single character, and it must be typed as two characters on any terminal.

2.3. Commands, Functions, and Variables

Most of the EMACS commands documented herein are members of this 9-bit character set. Others are pairs of characters from that set. However, EMACS doesn't really define commands directly. Instead, EMACS defines *functions*, which have long names such as "^R Down Real Line", and then the functions are connected to *commands* such as C-N through a dispatch table. When we say that C-N moves the cursor down a line, we are glossing over a distinction which is unimportant for ordinary use, but essential for customization: it is the function ^R Down Real Line which knows how to move down a line, and C-N moves down a line *because* it is connected to that function. We usually ignore this subtlety to keep things simple. To give the extension-writer the information he needs, we state the name of the function which really does the work in parentheses after mentioning the command name. For example: "C-N (^R Down Real Line) moves the cursor down a line". In the EMACS wall chart, the function names are used as a form of very brief documentation for the command characters. See section 5.2 [Functions], page 22.

The "^R " which appears at the front of the function name is simply part of the name. By convention, a certain class of functions have names which start with "^R ".

While we are on the subject of customization information which you should not be frightened of, it's a good time to tell you about *variables*. Often the description of a command will say "to change this, set the variable Mumble Foo". A variable is a name used to remember a value. EMACS contains many variables which are there so that you can change them if you want to customize. The variable's value is examined by some command, and changing the value makes the command behave differently. Until you are interested in customizing, you can ignore this information. When you are ready to be interested, read the basic information on variables, and then the information on individual variables will make sense. See section 22.3 [Variables], page 109.

2.4. Notational Conventions for ASCII Characters

Control characters in files, your EMACS buffer, or TECO programs, are ordinary ASCII characters and are represented as uparrow or caret followed by the corresponding non-control character: control-E is represented as ↑E. The special 9-bit character set applies only to typing EMACS commands.

CRLF is the traditional term for a carriage return followed by a linefeed. This sequence of two characters is what separates lines in text being edited. Normally, EMACS commands make this sequence appear to be a single character, but TECO code must deal with the realities. A return or a linefeed which is not part of a CRLF is called "stray". EMACS usually treats them as part of the line and displays them as ^M and ^J. The TECO flag FS ^M PRINT♦ controls how they are displayed. See section 22.5 [FS Flags], page 113.

Other ASCII characters with special names include tab (011), backspace (010), linefeed (012), altmode (033), space (040), and rubout (177). To make it clear whether

we are talking about a 9-bit character or an ASCII character, we capitalize names of 9-bit characters and leave names of ASCII characters in lower case. Note that the 9-bit characters Tab and Control-I are different, but the ASCII characters tab and control-I are the same.

Most control characters when present in the EMACS buffer are displayed with a caret; thus, ^A for ASCII ↑A. Rubout is displayed as ^?, because by stretching the meaning of "control" it can be interpreted as ASCII control-?. A backspace is usually displayed as ^H since it is ASCII control-H, because most displays cannot do overprinting.

Altmode is the ASCII code 033, sometimes labeled "Escape" or "Alt". Altmode is often represented by itself in this document (remember, it is an ASCII character and can therefore appear in files). It looks like this: $. On some terminals, altmode looks just like the dollar sign character. If that's so on yours, you should assume that anything you see in the on-line documentation which looks like a dollar sign is really an altmode unless you are specifically told it's a dollar sign. The dollar sign character is not particularly important in EMACS and we will rarely have reason to mention it.

Chapter Three

Basic Editing Commands

We now give the basics of how to enter text, make corrections, and save the text in a file. If this material is new to you, you might learn it more easily by running the TEACH-EMACS program.

3.1. Inserting Text

To insert printing characters into the text you are editing, just type them. Normally (when EMACS is at top level), they are inserted into the text at the cursor (that is, at *point*), which moves forward. Any characters after the cursor move forward too. If the cursor is in between a FOO and a BAR, typing XX produces and displays FOOXXBAR with the cursor before the "B". This method of insertion works for printing characters and space, but other characters act as editing commands and do not insert themselves. If you need to insert a control character, Altmode, Tab or Rubout, you must *quote* it by typing the C-Q command first. "C" refers to the Control bit. See section 2 [Characters], page 9.

To correct text you have just inserted, you can use Rubout. Rubout deletes the character *before* the cursor (not the one that the cursor is on top of or under; that is the character *after* the cursor). The cursor and all characters after it move backwards. You can rub out a line boundary by typing Rubout when the cursor is at the beginning of a line.

To end a line and start typing a new one, type Return (Customizers, note: this runs the function ^R CRLF). You can also type Return to break an existing line into two. A Rubout after a Return will undo it. Return really inserts two characters, a carriage return and a linefeed (a CRLF), but almost everything in EMACS makes them look like just one character, which you can think of as a line-separator character.

If you add too many characters to one line, without breaking it with a Return, the line will grow to occupy two (or more) lines on the screen, with a "!" at the extreme right margin of all but the last of them. The "!" says that the following screen line is not really a distinct line in the file, but just the *continuation* of a line too long to fit the screen.

3.2. Moving The Cursor

To do more than insert characters, you have to know how to move the cursor. Here are a few of the commands for doing that.

C-A	Moves to the beginning of the line.
C-E	Moves to the end of the line.
C-F	Moves forward over one character.
C-B	Moves backward over one character.
C-N	Moves down one line, vertically. If you start in the middle of one line, you end in the middle of the next. From the last line of text, it creates a new line.
C-P	Moves up one line, vertically.
C-L	Clears the screen and reprints everything. C-U C-L reprints just the line that the cursor is on.
C-T	Transposes two characters (the ones before and after the cursor).
M-<	Moves to the top of your text.
M->	Moves to the end of your text.

3.3. Erasing Text

Rubout	Delete the character before the cursor.
C-D	Delete the character after the cursor.
C-K	Kill to the end of the line.

You already know about the Rubout command which deletes the character before the cursor. Another command, Control-D, deletes the character after the cursor, causing the rest of the text on the line to shift left. If Control-D is typed at the end of a line, that line and the next line are joined together.

To erase a larger amount of text, use the Control-K command, which kills a line at a time. If Control-K is done at the beginning or middle of a line, it kills all the text up to the end of the line. If Control-K is done at the end of a line, it joins that line and the next line.

See section 9.1 [Killing], page 37, for more flexible ways of killing text.

3.4. Files

The commands above are sufficient for creating text in the EMACS buffer. The more advanced EMACS commands just make things easier. But to keep any text permanently you must put it in a *file*. Files are the objects which Twenex uses for storing data for communication between different programs or to hold onto for a length of time. To tell EMACS to edit text in a file, choose a *filename*, such as FOO.BAR, and type C-X C-V FOO.BAR<cr>. This *visits* the file FOO.BAR so that its contents appear on the screen for editing. You can make changes, and then *save* the file by typing C-X C-S. This makes the changes permanent and actually changes the file FOO.BAR. Until then, the changes are only inside your EMACS, and the file

FOO.BAR is not really changed. If the file FOO.BAR doesn't exist, and you want to create it, visit it as if it did exist. When you save your text with C-X C-S the file will be created.

Of course, there is a lot more to learn about using files. See section 13 [Files], page 57.

3.5. Help

If you forget what a command does, you can find out with the Help character. The Help character is typed as Control-_. Type Help followed by C and the command you want to know about. Help can help you in other ways as well. See section 7 [Help], page 31.

3.6. Using Blank Lines Can Make Editing Faster

C-O	Insert one or more blank lines after the cursor.
C-X C-O	Delete all but one of many consecutive blank lines.

One thing you should know is that it is much more efficient to insert text at the end of a line than in the middle. So if you want to stick a new line before an existing one, it is better to make a blank line there first and then type the text into it, rather than inserting the new text at the beginning of the existing line and then insert a line separator. It is also clearer what is going on while you are in the middle.

To make a blank line, you can type Return and then C-B. But there is a single character for this: C-O (Customizers this is the built-in function ^R Open Line). So, instead of typing FOO Return to insert a line containing FOO, type C-O FOO.

If you want to insert many lines, you should type many C-O's at the beginning (or you can give C-O an argument to tell it how many blank lines to make. See section 4 [Arguments], page 17, for how). As you then insert lines of text, you will notice that Return behaves strangely: it "uses up" the blank lines instead of pushing them down.

If you don't use up all the blank lines, you can type C-X C-O (the function ^R Delete Blank Lines) to get rid of all but one. C-X C-O on a blank line deletes any other blank lines above and below that one, leaving only one blank line. C-X C-O on a nonblank line deletes any following blank lines, but does not affect preceding blank lines.

Chapter Four

Giving Numeric Arguments to EMACS Commands

Any EMACS command can be given a *numeric argument*. Some commands interpret the argument as a repetition count. For example, giving an argument of ten to the C-F command (move forward one character) moves forward ten characters. With these commands, no argument is equivalent to an argument of one.

Some commands care only about whether there is an argument, and not about its value; for example, the command M-Q (^R Fill Paragraph) with no arguments fills text, but with an argument justifies the text as well.

Some commands use the value of the argument, but do something peculiar when there is no argument. For example, the C-K (^R Kill Line) command with an argument <n> kills <n> lines and the line separators that follow them. But C-K with no argument is special; it kills the text up to the next line separator, or, if point is right at the end of the line, it kills the line separator itself. Thus, two C-K commands with no arguments can kill a nonblank line, just like C-K with an argument of one.

The fundamental way of specifying an argument is to use the C-U (^R Universal Argument) command followed by the optional minus sign and the digits. C-U followed by a non-digit other than a minus sign has the special meaning of "multiply by four". It multiplies the argument for the next command by four. Two such C-U's multiply it by sixteen. Thus, C-U C-U C-F moves forward sixteen characters. It is a good way to move forward "fast", since it moves about 1/4 of a line on most terminals. Other useful combinations are C-U C-N, C-U C-U C-N (move down a good fraction of a screen), C-U C-U C-O (make "a lot" of blank lines), and C-U C-K (kill four lines). With commands like M-Q that care whether there is an argument but not what the value is, C-U is a good way of saying "I want an argument".

A few commands treat a plain C-U differently from an ordinary argument. A few others may treat an argument of just a minus sign differently from an argument of -1. These unusual cases will be described when they come up; they are always for reasons of convenience of use.

There are other, terminal-dependent ways of specifying arguments. They have the same effect but may be easier to type. See the appendix. If your terminal has a numeric keypad which sends something recognizably different from the ordinary digits, it is possible to program EMACS to allow use of the numeric keypad for specifying arguments. The libraries VT52 and VT100 provide such a feature for those two types of terminals. See section 22.2 [Libraries], page 108.

4.1. Autoarg Mode

Users of ASCII keyboards may prefer to use Autoarg mode. Autoarg mode means that you don't need to type C-U to specify a numeric argument. Instead, you type just the digits. Digits preceding an ordinary inserting character are themselves inserted, but digits preceding an Altmode or Control character serve as an argument to it and are not inserted. Autoarg mode currently has no effect on minus signs, so negative arguments still require C-U.

To use Autoarg mode, set the variable Autoarg Mode nonzero. See section 22.3 [Variables], page 109.

Autoargument digits echo at the bottom of the screen; the first nondigit causes them to be inserted or uses them as an argument. To insert some digits and nothing else, you must follow them with a Space and then rub it out. C-G cancels the digits, while Rubout inserts them all and then rubs out the last.

Chapter Five

Extended (Meta-X) Commands and Functions

Not all EMACS commands are of the one or two character variety you have seen so far. Many commands have long names composed of English words. This is for two reasons: the long names are easier to remember and more suggestive, and there are not enough two character combinations for every command to have one.

The commands with long names are known as *extended commands* because they extend the set of two-character commands.

5.1. Issuing Extended Commands

M-X	Begin an extended command. Follow by command name and arguments.
C-M-X	Begin an extended command. Follow by the command name only; the command will ask for any arguments.
C-X Altmode	Re-execute recent extended command.

Extended commands are also called *M-X commands*, because they all start with the character Meta-X (^R Extended Command). The M-X is followed by the command's long, suggestive name, actually the name of a function to be called. Terminate the name of the function with a Return (unless you are supplying string arguments; see below). For example, Meta-X Auto Fill Mode<cr> invokes the function Auto Fill Mode. This function when executed turns Auto Fill mode on or off.

We say that M-X Foo<cr> "calls the function FOO". When documenting the individual extended commands, we will call them *functions* to avoid confusion between them and the one or two character *commands*. We will also use "M-X" as a title like "Mr." for functions, as in "use M-X Foo". The "extended command" is what you *type*, starting with M-X, and what the command *does* is call a function. The name that goes in the command is the name of the command and is also the name of the function, and both terms will be used.

There are a great many functions in EMACS for you to call. They will be described elsewhere in the manual, according to what they do. Here we are concerned only with extended commands in general.

5.1.1. Typing The Command Name

When you type M-X, the cursor moves down to the echo area at the bottom of the screen. "M-X" is printed there, and when you type the command name it echoes there. This is known as *reading a line in the echo area*. You can use Rubout to cancel one character of the command name, or C-U or C-D to cancel the entire command name. A C-G cancels the whole M-X, and so does a Rubout when the command name is empty. These editing characters apply any time EMACS reads a line in the echo area, not just within M-X.

The string "M-X" which appears in the echo area is called a *prompt*. The prompt always tells you what sort of argument is required and what it is going to be used for; "M-X" means that you are inside of the M-X command and should type the name of a function to be called. You can replace the prompt "M-X" with some other string by defining the variable Read Command Prompt.

5.1.2. Completion

You can abbreviate the name of the command, typing only the beginning of the name, as much as is needed to identify the command unambiguously. You can also use completion on the function name. This means that you type part of the command name, and EMACS visibly fills in the rest, or as much as can be determined from the part you have typed.

You request completion by typing an Altmode (◆). For example, if you type M-X Au◆, the "Au" expands to "Auto " because all command names which start with "Au" continue with "to ". If you ask for completion when there are several alternatives for the next character, the bell rings and nothing else happens. Altmode is also the way to terminate the command name and begin the string arguments, but it only does this if the command name completes in full. In that case, an Altmode appears after the command name in the echo area. (If the command name does not complete in full, it is ambiguous, so it would be useless to type the arguments yet).

Space is another way to request completion, but it completes only one word. Successive Spaces complete one word each, until either there are multiple possibilities or the end of the name is reached. If the first word of a command is Edit, List, Kill, View or What, it is sufficient to type just the first letter and complete it with a Space. (This does not follow from the usual definition of completion, since the single letter is ambiguous; it is a special feature added because these words are so common).

Typing "?" in the middle of the command name prints a list of all the command names which begin with what you have typed so far. You can then go on typing the name.

5.1.3. Numeric Arguments and String Arguments

Some functions can use numeric prefix arguments. Simply give the Meta-X command an argument and Meta-X will pass it along to the function which it calls. The argument appears before the "M-X" in the prompt, as in "69 M-X", to remind you that the function you call will receive a numeric argument.

Some functions require *string arguments* (sometimes called *suffix arguments*). For those functions, the function name is terminated with a single Altmode, after which come the arguments, separated by Altmodes. After the last argument, type a Return to cause the function to be executed. For example, the function Describe prints the full documentation of a function (or a variable) whose name must be given as a string argument. An example of using it is

```
Meta-X Describe♦Apropos<cr>
```

which prints the full description of the function named Apropos.

An alternate way of calling extended commands is with the command C-M-X (^R Instant Extended Command). It differs from plain M-X in that the function itself reads any string arguments. This can be useful if the string argument is a filename or a command name, because the function knows that and gives the argument special treatment such as completion. However, there are compensating disadvantages. For one thing, since the function has already been invoked, you can't rub out from the arguments into the function name. For another, it is not possible to save the whole thing, function name and arguments, for you to recall with C-X Altmode (see below). So C-M-X saves *nothing* for C-X Altmode. The prompt for C-M-X is "C-M-X". You can override it with the variable Instant Command Prompt.

5.1.4. Repeating an Extended Command

The last few extended commands you have executed are saved and you can repeat them. We say that the extended command is saved, rather than that the function is saved, because the whole command, including arguments, is saved.

To re-execute a saved command, use the command C-X Altmode (^R Re-execute Minibuffer). It retypes the last extended command and asks for confirmation. With an argument, it repeats an earlier extended command; 2 means repeat the next to the last command, etc. You can also use the minibuffer to edit a previous extended command and re-execute it with changes (See section 23 [Minibuffer], page 123.).

Note: Extended commands and functions were once called "MM commands", but this term is obsolete. If you see it in any user documentation, please report it. Ordinary one or two character commands used to be known as "^R" commands, and the term may still be used in the on-line documentation of some functions; please report this also.

5.2. Arcane Information about M-X Commands

You can skip this section if you are not interested in customization, unless you want to know what is going on behind the scenes.

5.2.1. MM

Extended commands were once called "MM" commands, because "MM" is a TECO expression which looks up a command name to find the associated program, and runs that program. Thus, the TECO expression

```
MM Apropos♦Word♦
```

means to run the Apropos command with the argument "word". You could type this expression into a minibuffer and get the same results as you would get from Meta-X Apropos♦Word<cr>. In fact, for the first year or so, EMACS had no Meta-X command, and that's what people did. See section 23 [Minibuffer], page 123, for information on the minibuffer.

"MM" actually tells TECO to call the subroutine in q-register "M". The first "M" means "call", and the second "M" says what to call. This subroutine takes a string argument which is the name of a function and looks it up. Calling a function is built into TECO, but looking up the name is not; it is implemented by the program in q-register M. That's why "MM" is called that and not "Run" or "F↑Q".

5.2.2. Arguments in TECO Code

Functions can use one or two *prefix arguments* or *numeric arguments*. These are numbers (actually, TECO expressions) which go before the "MM". Meta-X can only give the MM command one argument. If you want to give it two, you must type it in using the minibuffer. When TECO code passes prefix arguments, they don't have to be numbers; they can also be strings, TECO buffer objects, etc. However, no more about that here.

When TECO code passes a string argument, it appears, terminated by an Altmode, after the Altmode which ends the function name. There can be any number of string arguments. In fact, the function can decide at run time how many string arguments to read. This makes it impossible to compile TECO code!

5.2.3. Commands and Functions

Actually, *every* command in EMACS simply runs a function. For example, when you type the command C-N, it runs the function "^R Down Real Line". You could just as well do C-U 1 M-X ^R Down Real Line<cr> and get the same effect. C-N can be thought of as a sort of abbreviation. We say that the command C-N has been *connected* to the function ^R Down Real Line. The name is looked up once when the command and function are connected, so that it does not have to be looked up again each time the command is used. For historical reasons, the default argument passed to a function which is connected to a command you typed is 1, but the default for MM

and for M-X is 0. This is why the C-U 1 was necessary in the example above. The documentation for individual EMACS commands usually gives the name of the function which really implements the command in parentheses after the command itself.

Just as any function can be called directly with M-X, so almost any function can be connected to a command. You can use the function Set Key to do this. Set Key takes the name of the function as a string argument, then reads the character command (including metizers or other prefix characters) directly from the terminal. To define C-N, you could type

```
M-X Set Key↓^R Down Real Line<cr>
```

and then type C-N. If you use the function View File often, you could connect it to the command C-X V (not normally defined). You could even connect it to the command C-M-V, replacing that command's normal definition. Set Key is good for redefining commands in the middle of editing. An init file or EVARS file can do it each time you run EMACS. See section 22.6 [Init], page 114.

5.2.4. Subroutines

EMACS is composed of a large number of functions, each with a name. Some of these functions are connected to commands; some are there for you to call with M-X; some are called by other functions. The last group are called subroutines. They usually have names starting with "&", as in "& Read Line", the subroutine which reads a line in the echo area. Although most subroutines have such names, any function can be called as a subroutine. Functions like ^R Down Real Line have names starting with ^R because you are not expected to call them directly, either. The purpose of the "&" or "^R" is to get those function names out of the way of command completion in M-X. M-X allows the command name to be abbreviated if the abbreviation is unique, and the commands that you are not interested in might have names that would interfere and make some useful abbreviation cease to be unique. The funny characters at the front of the name prevent this from happening.

5.2.5. Built-in Functions

Not all of the functions in EMACS are written in TECO. A few of the most frequently used single-character commands have definitions written in machine language. These include self-inserting characters, Rubout, C-F, and others. Such functions defined in machine language as part of TECO are called *built in* functions. Whereas the actual definition of an ordinary function is a string, the definition of a built-in function is just a number, the address of a routine in TECO.

Built-in functions can be confusing because the Help features know their names, but M-X normally does not. Their EMACS "definitions" are needed only for the sake of documentation and not for actually executing the functions, so they are put in a special library called BARE which is loaded only while the Help features are working.

For example, ^R Forward Character is the name of the function which implements the C-F command. If you try to invoke ^R Forward Character with M-X, since BARE is not loaded, the name is not defined. Set Key and EVARS files have the same

difficulties. You can make the names permanently available for all these purposes by loading BARE with M X Load Library♦BARE<cr>. (You could kill the BARE library after using it, since the definitions work fine once installed even if BARE is not loaded) However, in EVARS files, it is better to use the FS ^R INIT♦ command to obtain the definition of a built-in function.

Chapter Six

Moving Up And Down Levels

Subsystems and recursive editing levels are two states in which you are temporarily doing something other than editing the visited file as usual. For example, you might be editing a message that you wish to send, or looking at a documentation file with INFO. Running another fork under EMACS can also be thought of as a sort of "sublevel".

6.1. Subsystems

A *subsystem* is an EMACS function which is an interactive program in its own right: it reads commands in a language of its own, and displays the results. You enter a subsystem by typing an EMACS command which invokes it. Once entered, the subsystem runs until a specific command to exit the subsystem is typed. An example of an EMACS subsystem is INFO, the documentation reading program. Others are Backtrace and TDEBUG, used for debugging TECO programs, and BABYL, used for reading and editing mail files.

The commands understood by a subsystem are usually not like EMACS commands, because their purpose is something other than editing text. For example, INFO commands are designed for moving around in a tree-structured documentation file. In EMACS, most commands are Control or Meta characters because printing characters insert themselves. In most subsystems, there is no insertion of text, so non-Control non-Meta characters can be the commands.

While you are inside a subsystem, the mode line usually gives the name of the subsystem (as well as other information supplied by the subsystem, such as the filename and node name in INFO). You can tell that you are inside a subsystem because the mode line does not start with "EMACS", or with an open bracket ("[") which would indicate a recursive editing level. See section 1.1 [Mode Line], page 6.

Because each subsystem implements its own commands, we cannot guarantee anything about them. However, there are conventions for what certain commands ought to do:

C-]	aborts (exits without finishing up).
Backspace	Scrolls backward, like M-V in EMACS.
Space	Scrolls forward, like C-V in EMACS.
Q	Exits normally.
X	Begins an extended command, like M-X in EMACS.

Help or ? Prints documentation on the subsystem's commands.

Not all of these necessarily exist in every subsystem, however

6.2. Recursive Editing Levels

A *recursive editing level* is a state in which you are inside a command which has given you some text for you to edit. The text may or may not be part of the file you are editing. Recursive editing levels are indicated in the mode line by square brackets ("[" and "]").

For example, the command M-X Edit Options is for changing the settings of EMACS options by editing a list of option names and values. You use the same editing commands as always for making changes in this list; when you are finished, the changes take effect in your option settings. While you are editing the list of options, the mode line says "[Edit Options]". See section 22.3 [Variables], page 109.

A recursive editing level differs from a subsystem in that the commands are ordinary EMACS commands (though a handful may have been changed slightly), whereas a subsystem defines its own command language.

The text you edit inside a recursive editing level depends on the command which invoked the recursive editing level. It could be a list of options and values, or a list of tab stop settings, syntax table settings, a message to be sent, or any text that you might wish to compose.

Sometimes in a recursive editing level you edit text of the file you are visiting, just as at top level. Why would this be? Usually because a few commands are temporarily changed. For example, Edit Picture in the PICTURE library defines commands good for editing a picture made out of characters, then enters a recursive editing level. When you exit, the special picture-editing commands go away. Until then, the brackets in the mode line serve to remind you that, although the text you are editing is your file, all is not normal. See section 26 [PICTURE], page 143.

In any case, if the mode line says "[...]" you are inside a recursive editing level, and the way to exit (send the message, redefine the options, get rid of the picture-editing commands, etc.) is with the command C-M-Z (^R Exit). See section 6.3 [Exiting], page 27. If you change your mind about the command (you don't want to send the message, or change your options, etc.) then you should use the command C-] (Abort Recursive Edit) to get out. See section 24.1 [Aborting], page 125.

Inside recursive editing levels, the help option Help R is defined to print the full documentation of the command which invoked the recursive editing level. The other normal Help options are still available for asking about commands you want to use while inside the recursive edit.

When the text in the mode line is surrounded by parentheses, it means that you are inside a *Minibuffer*. A minibuffer is a special case of the recursive editing level. Like any other, it can be aborted safely with C-]. See section 23 [Minibuffer], page 123.

6.3. Exiting Levels; Exiting EMACS

C-X C-Z	Exit from EMACS to the superior fork.
C-M-Z	Exit from EMACS or from a recursive editing level.
M-X Compile	Exit from EMACS to EXEC and repeat the last Compile-class command.

The general EMACS command to exit is C-M-Z (^R Exit). This command is used to exit from a recursive editing level back to the top level of EMACS, and to exit from EMACS at top level back to EXEC. If your keyboard does not have a Meta key, you must type this command by means of a bit prefix character, as C-Z C-Z or as Altmode C-Z. Note carefully the difference between exiting a recursive editing level and aborting it: exiting allows the command which invoked the recursive editing level to finish its job with the text as you have edited it, whereas aborting cancels whatever the command was going to do. See section 24.1 [Aborting], page 125.

We cannot say in general how to exit a subsystem, since each subsystem defines its own command language, but the convention is to use the character "Q".

You can exit from EMACS back to the superior fork, usually EXEC, at any time, even within a recursive editing level, with the command C-X C-Z (^R Return to Superior). If this is used while you are inside a recursive editing level, then when EMACS is re-entered you will still be inside the recursive editing level.

If the superior fork really is EXEC, you can use M-X Compile to return to EXEC and repeat the last Compile, Load, or Debug EXEC command. It offers to save any buffers which need saving, first.

Exiting EMACS does not normally save the visited file, because it is not the case that users exit EMACS only when they are "finished editing". If you want the file saved, you must use C-X C-S. Exiting does cause an auto save if Auto Save mode is in use. M-X Compile does offer to save because with it you indicate specifically your desire to use the saved file.

Exiting from EMACS runs the function & Exit EMACS, which executes the value of the variable Exit Hook, if it is defined.

6.4. Running Subforks under EMACS

Running a subfork under EMACS is a little bit like running an EMACS subsystem in that you give EMACS a command to start it, and give it a command when you want to exit.

The difference is that a subsystem is implemented as a part of EMACS. It can call other parts of EMACS as a subroutine, for example. A subfork is an entirely separate program, and any program which you could run under EXEC can also be run under EMACS. However, subforks cannot be integrated as well with the rest of EMACS.

Control of subforks is done with the TECO command FZ, which can be used for loading an arbitrary program into a subfork of EMACS.

6.4.1. Inferior EXEC

An alternative to exiting EMACS is pushing to another EXEC under EMACS. You can probably do in this EXEC whatever you would have done after exiting, and it will not harm the EMACS. Do M-X Push to EXEC to get an inferior EXEC, and use the POP command to return to EMACS. Repeated use of Push to EXEC gets the same EXEC with its subfork unchanged. You can actually switch randomly between EMACS and one other program in this way, even if the EXEC on your machine does not support multiple forks. The variable Exec Name contains the name of the file to run, or 0 for the ordinary EXEC.

6.4.2. Reading Mail

An important use of subforks is for reading mail with MM. See section 6.5 [Mail], page 30.

6.4.3. Subforks in General

M-+ Start or resume a subfork.
M-, Kill a subfork.

The EFORK library, which you must load explicitly with Load Library (See section 22.2 [Libraries], page 108.), contains general functions for running several forks underneath EMACS. EMACS users do not need to wait for DEC to wake up and release the multi-forking EXEC; they can use multiple forks right now.

When EFORK is loaded, the command M-+ (^R Invoke Inferior) creates or resumes a subfork.

Creation of a subfork requires two arguments, which you must type. The first one is the fork handle, an arbitrary name by which you will refer to the fork later. The second one is the name of the file to run in the fork. Both arguments must be terminated with <cr>.

If the subfork terminates, you return to EMACS. You can return to EMACS anyway by typing C-G (the EMACS interrupt character).

To resume a subfork, use M-+ again, and specify the same handle. No distinction is made between upper case and lower case in the handle name. If you type just <cr> for the handle name, the most recently used subfork is resumed.

You can also create or resume an inferior EXEC with M-+. Specify EXEC as the handle to create a new EXEC. Specify * as the handle to resume an existing EXEC. Creating a new EXEC gets rid of any existing one.

M-X List Handles prints a list of the handles of all the existing subforks.

To kill a subfork, use M-Comma (^R Kill Inferior), which asks you to specify the handle of the fork to be killed. You cannot kill the inferior EXEC, if there is one, but asking to create a new one the next time you use it has much the same effect.

6.4.4. Ephemerons

The functions Execute Ephemeron and Display Ephemeron, in EFORK, run a program in an inferior fork and kill it as soon as it returns (whether because it is finished, or because you type C-G). Display Ephemeron pauses until you type a character before redisplaying the screen; it is for use if the program prints something you would like to read.

6.4.5. Services Obtained from an Inferior EXEC

The SYSTEM library, which you must load explicitly with Load Library (See section 22.2 [Libraries], page 108.), contains functions which communicate with Twenex by passing commands to an inferior EXEC which exists momentarily.

Most of the commands in SYSTEM print some sort of system status information. For example, there are

M-X ^R System Load Average
: Prints the one minute load average in the echo area. This function is expected to be used by connecting it to a command character, but the SYSTEM library does not connect it. You must connect it yourself with Set Key or in an init or EVARS file. It can, however, be called with M-X like any other function.

M-X Check Output Queue
: Prints the contents of the output queues. This requires an argument, which should be ALL, FAST or USER.

M-X Check Batch Queue
: Prints the contents of the batch queues. This requires an argument, which should be ALL, FAST or USER.

M-X Check Users
: Prints a list of the users on the system.

M-X SYSTAT
: Invokes SYSTAT. You may specify the argument to be passed to SYSTAT as an argument to this command. No argument, when using M-X, is equivalent to a null argument, which obtains the default SYSTAT printout.

M-X Check Job
: Prints your job status, using the I JOB command.

M-X Check Disk
: Performs I DISK on a directory which you must specify with an argument.

M-X Check Available
: Prints a list of available devices or terminal lines. You must specify LINES as an argument if you want that; otherwise, the default is to list the available devices.

Two other commands are

M-X Connect to Directory
: Changes your connected directory. Supply the directory name (including the brackets) as an argument, and the password as a second argument if it is needed. This command is always available; you need not load SYSTEM.

M-X Access to Directory

Performs an ACCESS command. Supply arguments as you would for Connect to Directory.

6.5. Reading Mail

To edit your mail file, use C-X R (Read Mail). This invokes a mail reading subsystem or subfork. If the variable Mail Reader Library is defined, it is the name of the subsystem to use; else if Mail Reader Program is defined, it is the name of the program to run in a subfork; otherwise, the program MM is used.

You can send mail from within MM as well as edit your mail. But if you want to send just one message, the easiest way is Control-X M (Send Mail). C-X M works by invoking MM, or whatever program or library you use to read mail, at a special entry point.

The command M-X Check Mail tells you whether you have any new mail to be read. The MAICHK library, if loaded, checks automatically every so often.

Chapter Seven

Self-Documentation Commands

EMACS provides extensive self-documentation features which revolve around a single character, called the Help character. At any time while using EMACS, you can type the Help character to ask for help. The Help character is actually typed as C-_ (Control-Underscore). On some terminals just figuring out how to type a Control-Underscore is hard! Typing Underscore and adding the Control key is what is supposed to work, but on some terminals it does not. Sometimes Control-Shift-O works. On VT-100 terminals, Control-/ and Control-? send a Control-_ character.

If you type Help while you are using a subsystem such as INFO, it prints a list of the commands of that subsystem.

If you type Help in the middle of a multi-character command, it often tells you about what sort of thing you should type next. For example, if you type M-X and then Help, it will tell you about M-X and how to type the name of the command. If you finish the *function name* and the Altmode and then type Help, it will tell you about the function you have specified so you can know what arguments it needs. If you type C-X and then type Help, it will tell you about the C-X commands.

But normally, when it's time for you to start typing a new command, Help offers you several options for asking about what commands there are and what they do. It prompts with "Doc (? for help):" at the bottom of the screen, and you should type a character to say what kind of help you want. You could type Help or "?" at this point to find out what options are available. The ones you are most likely to need are described here.

The most basic Help options are Help C and Help D. You can use them to ask what a particular command does. Help C is for character commands: type the command you want to know about after the Help and the "C" ("C" stands for Character). Thus, Help C M-F or Help C Altmode F tells you about the M-F command. Help D is for asking about functions (extended commands); type the name of the function and a Return. Thus, Help D Lisp Mode<cr> tells you about M-X Lisp Mode. Help D can also tell you the documentation of a variable, if you give it a variable's name instead of a function's name. "D" stands for "Describe", since Help D actually uses the function Describe to do the work.

A more complicated sort of question to ask is, "what are the commands for working with files?" For this, you can type Help A, followed by the string "file" and a Return. It prints a list of all the functions that have "file" anywhere in their names, including Save All Files, ^R Save File, Append to File, etc. If some of the functions are connected to commands, it will tell you. For example, it would say that you can invoke

^R Save File by typing C-X C-S. "A" stands for "Apropos", since Help A actually uses the function Apropos to do the substring matching. Help A does not list internal functions, only those the nonprogrammer is likely to use. If you want subroutines to be listed as well, you must call Apropos yourself.

Because Apropos looks only for functions whose names contain the string which you specify, you must use ingenuity in choosing substrings. If you are looking for commands for killing backwards and Help A Kill Backwards doesn't reveal any, don't give up. Try just Kill, or just Backwards, or just Back. Be persistent. Pretend you are playing Adventure.

If you are inside a recursive editing level, Help R prints out the complete documentation of that recursive editing level. See section 6.2 [Recursive], page 26. Help ? also tells you briefly what sort of recursive editing level you are in, in addition to describing the available Help options. If you are not inside a recursive editing level, Help R says that you are at top level.

If you aren't sure what characters you accidentally typed to produce surprising results, you can use Help L to find out ("L" stands for "What Lossage"). If you see commands that you don't know, you can use Help C to find out what they did.

If a command doesn't do what you thought you knew it should do, you can ask to see whether it has changed recently. Help N prints out the file called EMACS:EMACS.NEWS which is an archive of announcements of changes to EMACS.

To find out about the other Help options, type Help Help. That is, when the first Help asks for an option, type Help to ask what is available.

Finally, you should know about the documentation files for EMACS, which are EMACS.GUIDE and EMACS.CHART. EMACS.GUIDE is a version of the manual formatted to be printed out on a terminal or line printer. EMACS.CHART has a brief description of all the commands, known as the wall chart, because it is good to post on the wall near your terminal. A copy of the wall chart is included in this manual just before the index.

Chapter Eight

The Mark and the Region

In general, a command which processes an arbitrary part of the buffer must know where to start and where to stop. In EMACS, such commands start at point and end at a place called *the mark*. This range of text is called *the region*. Here are some commands for setting the mark:

C-@	Set the mark where point is.
C-Space	The same.
C-X C-X	Interchange mark and point.
M-@	Set mark after end of next word.
C-M-@	Set mark after end of next Lisp s-expression.
C-<	Set mark at beginning of buffer.
C->	Set mark at end of buffer.
M-H	Put region around current paragraph.
C-M-H	Put region around current Lisp defun.
C-X H	Put region around entire buffer.
C-X C-P	Put region around current page.

For example, if you wish to convert part of the buffer to all upper-case, you can use the C-X C-U command, which operates on the text in the region. You can first go to the beginning of the text to be capitalized, put the mark there, move to the end, and then type C-X C-U. Or, you can set the mark at the end of the text, move to the beginning, and then type C-X C-U. C-X C-U runs the function ^R Uppercase Region, whose name signifies that the region, or everything between point and the mark, is to be capitalized.

The most common way to set the mark is with the C-@ command or the C-Space command (^R Set/Pop Mark). They set the mark where point is. Then you can move point away, leaving the mark behind.

It isn't actually possible to type C-Space on non-Meta keyboards. Yet on many terminals the command appears to work anyway! This is because trying to type a Control-Space on those terminals actually sends the character C-@, which means the same thing as C-Space. A few keyboards just send a Space. If you have one of them, you type C-@, or customize your EMACS.

Since terminals have only one cursor, there is no way for EMACS to show you where the mark is located. You have to remember. The usual solution to this problem is to set the mark and then use it soon, before you forget where it is. But you can see where the mark is with the command C-X C-X (^R Exchange Point and Mark) which puts the mark where point was and point where the mark was. Thus, the previous

location of the mark is shown, but the region specified is not changed. C-X C-X is also useful when you are satisfied with the location of point but want to move the other end of the region; do C-X C-X to put point at that end and then you can adjust it. The end of the region which is at point can be moved, while the end which is at the mark stays fixed.

If you insert or delete before the mark, the mark does not stay with the characters it was between. If the buffer contains "FOO BAR" and the mark is before the "B", then if you delete the "F" the mark will be before the "A". This is an unfortunate result of the simple way the mark is implemented. It is best not to delete or insert at places above the mark until you are finished using it and don't care where it drifts to.

8.1. Commands to Mark Textual Objects

There are commands for placing the mark on the other side of a certain object such as a word or a list, without having to move there first. M-@ (^R Mark Word) puts the mark at the end of the next word, while C-M-@ (^R Mark Sexp) puts it at the end of the next s-expression. C-> (^R Mark End) puts the mark at the end of the buffer, while C-< (^R Mark Beginning) puts it at the beginning. These characters allow you to save a little typing, sometimes.

Other commands set both point and mark, to delimit an object in the buffer. M-H (^R Mark Paragraph) puts point at the beginning of the paragraph it was inside of (or before), and puts the mark at the end. M-H does all that's necessary if you wish to indent, case-convert, or kill a whole paragraph. C-M-H (^R Mark Defun) similarly puts point before and the mark after the current or next defun. C-X C-P (^R Mark Page) puts point before the current page (or the next or previous, according to the argument), and mark at the end. The mark goes after the terminating page delimiter (to include it), while point goes after the preceding page delimiter (to exclude it). Finally, C-X H (^R Mark Whole Buffer) makes the region the entire buffer by putting point at the beginning and the mark at the end.

8.2. The Ring of Marks

Aside from delimiting the region, the mark is also useful for remembering a spot that you may want to go back to. To make this feature more useful, EMACS remembers 16 previous locations of the mark. Most commands that set the mark push the old mark onto this stack. To return to a marked location, use C-U C-@ (or C-U C-Space). This moves point to where the mark was, and restores the mark from the stack of former marks. So repeated use of this command moves point to all of the old marks on the stack, one by one. Since the stack is actually a ring, enough uses of C-U C-@ bring point back to where it was originally. Insertion and deletion can cause the saved marks to drift, but they are still good for this purpose because they are approximately right.

Some commands whose primary purpose is to move point a great distance take advantage of the stack of marks to give you a way to undo the command. The best

example is M-<, which moves to the beginning of the buffer. It sets the mark first, so that you can use C-U C-@ or C-X C-X to go back to where you were. Searches sometimes set the mark; it depends on how far they move. Because of this uncertainty, searches type out "^@" if they set the mark. The normal situation is that searches leave the mark behind if they move at least 500 characters, but you can change that value since it is kept in the variable Auto Push Point Option. By setting it to 0, you can make all searches set the mark. By setting it to a very large number such as ten million, you can prevent all searches from setting the mark. The string to be typed out when this option does its thing is kept in the variable Auto Push Point Notification.

Chapter Nine

Killing and Moving Text

The commonest way of moving or copying text with EMACS is to kill it, and get it back again in one or more places. This is very safe because the last several pieces of killed text are all remembered, and it is versatile, because the many commands for killing syntactic units can also be used for moving those units. There are also other ways of moving text for special purposes.

9.1. Deletion and Killing

Most commands which erase text from the buffer save it so that you can get it back if you change your mind, or move or copy it to other parts of the buffer. These commands are known as *kill* commands. The rest of the commands that erase text do not save it; they are known as *delete* commands. The delete commands include C-D and Rubout, which act on single characters, and those commands that delete only spaces or line separators. Commands that can destroy significant amounts of nontrivial data generally kill. The commands' names and individual descriptions use the words "kill" and "delete" to say which they do. If you do a kill command by mistake, you can use the Undo command to undo it (See section 24.3 [Undo], page 128.).

C-D	Delete next character.
Rubout	Delete previous character.
M-\	Delete spaces and tabs around point.
C-X C-O	Delete blank lines around the current line.
M-^	Join two lines by deleting the CRLF and any indentation.
C-K	Kill rest of line or one or more lines.
C-W	Kill region (from point to the mark).
M-D	Kill a word.
M-Rubout	Kill a word backwards.
C-X Rubout	Kill back to beginning of sentence.
M-K	Kill to end of sentence.
C-M-K	Kill s-expression.
C-M-Rubout	Kill s-expression backwards.

9.1.1. Deletion

The most basic delete commands are C-D and Rubout. C-D deletes the character after the cursor, the one the cursor is "on top of" or "underneath". The cursor doesn't move. Rubout deletes the character before the cursor, and moves the cursor back. Line separators act like single characters when deleted. Actually, C-D and Rubout aren't always delete commands; if you give an argument, they kill instead. This prevents you from losing a great deal of text by typing a large argument to a C-D or Rubout.

The other delete commands are those which delete only formatting characters: spaces, tabs and line separators. M-\ (^R Delete Horizontal Space) deletes all the spaces and tab characters before and after point. C-X C-O (^R Delete Blank Lines) deletes all blank lines after the current line, and if the current line is blank deletes all blank lines preceding the current line as well (leaving one blank line, the current line). M-^ (^R Delete Indentation) joins the current line and the previous line, or the current line and the next line if given an argument. See section 11.3 [Indentation], page 48.

A function ^R Delete Region used to exist, but it was too dangerous. When you want to delete a large amount of text without saving a copy of it (perhaps because it is very big), you can set point and mark around the text and then type

```
M-Altmode
MRK♦♦
```

(This is a use of the minibuffer. See section 23 [Minibuffer], page 123.).

9.1.2. Killing by Lines

The simplest kill command is the C-K command (^R Kill Line). If given at the beginning of a line, it kills all the text on the line, leaving it blank. If given on a blank line, the blank line disappears. As a consequence, if you go to the front of a non-blank line and type two C-K's, the line disappears completely.

More generally, C-K kills from point up to the end of the line, unless it is at the end of a line. In that case it kills the line separator following the line, thus merging the next line into the current one. Invisible spaces and tabs at the end of the line are ignored when deciding which case applies, so if point appears to be at the end of the line, you can be sure the line separator will be killed.

If C-K is given a positive argument, it kills that many lines, and the separators that follow them (however, text on the current line before point is spared). With a negative argument, it kills back to a number of line beginnings. An argument of -2 means kill back to the second line beginning. If point is at the beginning of a line, that doesn't count.

C-K with an argument of zero kills all the text before point on the current line.

9.1.3. Other Kill Commands

A kill command which is very general is C-W (^R Kill Region), which kills everything between point and the mark. With this command, you can kill any contiguous characters, if you first set the mark at one end of them and go to the other end.

Other syntactic units can be killed: words, with M-Rubout and M-D (See section 11.1 [Words], page 45.); s-expressions, with C-M-Rubout and C-M-K (See section 20.5.1 [S-expressions], page 93.); sentences, with C-X Rubout and M-K (See section 11.2 [Sentences], page 47.).

9.2. Un-Killing

Un-killing is getting back text which was killed. The usual way to move or copy text is to kill it and then un-kill it one or more times.

C-Y	Yank (re-insert) last killed text.
M-Y	Replace re-inserted killed text with the previously killed text.
M-W	Save region as last killed text without killing.
C-M-W	Append next kill to last batch of killed text.

Killed text is pushed onto a *ring buffer* called the *kill ring* that remembers the last 8 blocks of text that were killed. (Why it is called a ring buffer will be explained below). The command C-Y (^R Un-kill) reinserts the text of the most recent kill. It leaves the cursor at the end of the text, and puts the mark at the beginning. Thus, a single C-W undoes the C-Y (M-X Undo also does so). C-U C-Y leaves the cursor in front of the text, and the mark after. This is only if the argument is specified with just a C-U, precisely. Any other sort of argument, including C-U and digits, has an effect described below.

If you wish to copy a block of text, you might want to use M-W (^R Copy Region), which copies the region into the kill ring without removing it from the buffer. This is approximately equivalent to C-W followed by C-Y, except that M-W does not mark the buffer as "changed" and does not temporarily change the screen. Note that there is only one kill ring, and switching buffers or files has no effect on it. After visiting a new file, whatever was last killed in the previous file is still on top of the kill ring.

9.2.1. Appending Kills

Normally, each kill command pushes a new block onto the kill ring. However, two or more kill commands in a row combine their text into a single entry on the ring, so that a single C-Y command gets it all back as it was before it was killed. This means that you don't have to kill all the text in one command; you can keep killing line after line, or word after word, until you have killed it all, and you can still get it all back at once. (Thus we join television in leading people to kill thoughtlessly).

Commands that kill forward from point add onto the end of the previous killed text. Commands that kill backward from point add onto the beginning. This way, any sequence of mixed forward and backward kill commands puts all the killed text into one entry without rearrangement.

If a kill command is separated from the last kill command by other commands, it starts a new entry on the kill ring, unless you tell it not to by saying C-M-W (^R Append Next Kill) in front of it. The C-M-W tells the following command, if it is a kill command, to append the text it kills to the last killed text, instead of starting a new entry. With C-M-W, you can kill several separated pieces of text and accumulate them to be yanked back in one place.

9.2.2. Un-killing Earlier Kills

To recover text that was killed some time ago (that is, not the most recent victim), you need the Meta-Y (^R Un-kill Pop) command. The M-Y command should be used only after a C-Y command or another M-Y. It takes the un-killed text and replaces it with the text from an earlier kill.

You can think of all the last few kills as living in a ring. After a C-Y command, the text at the front of the ring is also present in the buffer. M-Y "rotates" the ring, bringing the previous string of text to the front, and this text replaces the other text in the buffer as well. Enough M-Y commands can rotate any part of the ring to the front, so you can get at any killed text as long as it is recent enough to be still in the ring. Eventually the ring rotates all the way around and the most recent killed text comes to the front (and into the buffer) again. M-Y with a negative argument rotates the ring backwards. If the region doesn't match the text at the front of the ring, M-Y is not allowed.

In any case, when the text you are looking for is brought into the buffer, you can stop doing M-Y's and it will stay there. It's really just a copy of what's at the front of the ring, so editing it does not change what's in the ring. And the ring, once rotated, stays rotated, so that doing another C-Y gets another copy of what you rotated to the front with M-Y.

If you change your mind about un-killing, a C-W or M-X Undo gets rid of the un-killed text at any point, after any number of M-Y's. C-W pushes the text onto the ring again. M-X Undo does not.

If you know how many M-Y's it would take to find the text you want, then there is an alternative. C-Y with an argument greater than one restores the text the specified number of entries down on the ring. Thus, C-U 2 C-Y gets the next to the last block of killed text. It differs from C-Y M-Y in that C-U 2 C-Y does not permanently rotate the ring.

A way of viewing the contents of the kill ring is

```
M-X View Q-register♦..K<cr>
```

You must add one to the indices listed by this command, to get the argument to use with C-Y to yank any particular string.

9.3. Other Ways of Copying Text

Usually we copy or move text by killing it and un-killing it, but there are other ways that are useful for copying one block of text in many places, or for copying many scattered blocks of text into one place.

9.3.1. Accumulating Text

You can accumulate blocks of text from scattered locations either into a buffer or into a file if you like.

To append them into a buffer, use the command C-X A <buffername><cr> (^R Append to Buffer), which inserts a copy of the region into the specified buffer at the location of point in that buffer. If there is no buffer with the name you specify, one is created, empty. If you append text into a buffer which is visiting a file, the copied text goes into the middle of the text of the file.

Point in that buffer is left at the end of the copied text, so successive uses of C-X A accumulate the text in the specified buffer in the same order as they were copied. If C-X A is given an argument, point in the other buffer is left before the copied text, so successive uses of C-X A add text in reverse order.

You can retrieve the accumulated text from that buffer with M-X Insert Buffer♦<buffername><cr>. This inserts a copy of the text in that buffer into the selected buffer. You can also select the other buffer for editing. See section 14 [Buffers], page 67, for background information on buffers.

Strictly speaking, C-X A does not always append to the text already in the buffer. But if it is used on a buffer which starts out empty, it does keep appending to the end.

To accumulate text into a file, use the command M-X Append to File♦<filename><cr>. It adds the text of the region to the end of the specified file. M-X Prepend to File adds the text to the beginning of the file instead. The file is changed immediately on disk. If you wish to insert the text into a copy of the file in an EMACS buffer, you must append to that buffer instead.

9.3.2. Copying Text Many Times

When you want to insert a copy of the same piece of text frequently, the kill ring becomes impractical, since the text moves down on the ring as you edit, and will be in an unpredictable place on the ring when you need it again. For this case, you can use the commands C-X X (^R Put Q-register) and C-X G (^R Get Q-register) to move the text.

C-X X<q> stores a copy of the text of the region in a place called q-register <q>. <q> can be a letter or a number. This gives 36 places in which you can store a piece of text. With an argument, C-X X deletes the text as well. C-X G<q> inserts in the buffer the text from q-register <q>. Normally it leaves point before the text and places the mark after, but with a numeric argument it puts point after the text and the mark before.

The q-registers are important temporary variables in TECO programming, but you don't have to understand them, only to know that what you save with C-X X A is what you will get with C-X G A.

Do not use q-registers M and R in this way, if you are going to use the TECO commands MM and MR.

Chapter Ten

Searching

Like other editors, EMACS has commands for searching for an occurrence of a string. The search command is unusual in that it is *incremental*; it begins to search before you have finished typing the search string. As you type in the search string, EMACS shows you where it would be found. When you have typed enough characters to identify the place you want, you can stop.

C-S	Search forward.
C-R	Search backward.
C-S ♦ C-W	Word search, ignoring whitespace.

The command to search is C-S (^R Incremental Search). C-S reads in characters and positions the cursor at the first occurrence of the characters that you have typed. If you type C-S and then F, the cursor moves right after the first "F". Type an "O", and see the cursor move to after the first "FO". After another "O", the cursor is after the first "FOO" after the place where you started the search. At the same time, the "FOO" has echoed at the bottom of the screen.

If you type a mistaken character, you can rub it out. After the FOO, typing a rubout makes the "O" disappear from the bottom of the screen, leaving only "FO". The cursor moves back to the "FO". Rubbing out the "O" and "F" moves the cursor back to where you started the search.

When you are satisfied with the place you have reached, you can type an Altmode, which stops searching, leaving the cursor where the search brought it. Also, any command not specially meaningful in searches stops the searching and is then executed. Thus, typing C-A would exit the search and then move to the beginning of the line. Altmode is necessary only if the next command you want to type is a printing character, Rubout, Altmode or another search command, since those are the characters that would not exit the search.

Sometimes you search for "FOO" and find it, but not the one you expected to find. There was a second FOO that you forgot about, before the one you were looking for. Then type another C-S and the cursor will find the next FOO. This can be done any number of times. If you overshoot, you can rub out the C-S's. You can also repeat the search after exiting it, if the first thing you type after entering another search (when the argument is still empty) is a C-S.

If your string is not found at all, the echo area says "Failing I-Search". The cursor is after the place where EMACS found as much of your string as it could. Thus, if you search for FOOT, and there is no FOOT, you might see the cursor after the FOO in

FOOL. At this point there are several things you can do. If your string was mistyped, you can rub some of it out and correct it. If you like the place you have found, you can type Altmode or some other EMACS command to "accept what the search offered". Or you can type C-G, which throws away the characters that could not be found (the "T" in "FOOT"), leaving those that were found (the "FOO" in "FOOT"). A second C-G at that point undoes the search entirely.

The C-G "quit" command does special things during searches; just what, depends on the status of the search. If the search has found what you specified and is waiting for input, C-G cancels the entire search. The cursor moves back to where you started the search. If C-G is typed while the search is actually searching for something or updating the display, or after search failed to find some of your input (having searched all the way to the end of the file), then only the characters which have not been found are discarded. Having discarded them, the search is now successful and waiting for more input, so a second C-G will cancel the entire search. Make sure you wait for the first C-G to ding the bell before typing the second one; if typed too soon, the second C-G may be confused with the first and effectively lost.

You can also type C-R at any time to start searching backwards. If a search fails because the place you started was too late in the file, you should do this. Repeated C-R's keep looking for more occurrences backwards. A C-S starts going forwards again. C-R's can be rubbed out just like anything else. If you know that you want to search backwards, you can use C-R instead of C-S to start the search, because C-R is also a command (^R Reverse Incremental Search) to search backward. Note to all customizers: all this command does is call the current definition of ^R Incremental Search with a negative argument.

A non-incremental search is also available. Type Altmode right after the C-S to get it. Do

```
M-X Describe♦^R String Search<cr>
```

for details. Some people who prefer non-incremental searches put that function on Meta-S, and ^R Character Search (do M-X Describe♦ for details) on C-S. It can do one useful thing which incremental search cannot: search for words regardless of where the line breaks.

Word search searches for a sequence of words without regard to how the words are separated. More precisely, you type a string of many words, using single spaces to separate them, and the string can be found even if there are multiple spaces or line separators between the words. Other punctuation such as commas or periods must match exactly. This is useful in conjunction with documents formatted by text justifiers. If you edit while looking at the printed, formatted version, you can't tell where the line breaks are in the source file. With word search, you can search without having to know.

Word search is a special case of non-incremental search and is invoked with C-S Altmode C-W. This is followed by the search string, which must always be terminated with an Altmode. Searching does not start until the final Altmode is typed.

Chapter Eleven

Commands for English Text

EMACS enables you to manipulate words, sentences, or paragraphs of text. In addition, there are commands to fill text, and convert case.

Editing files of text in a human language ought to be done using Text mode rather than Fundamental mode. Invoke M-X Text Mode to enter Text mode. See section 20.1 [Major Modes], page 87. M-X Text Mode causes Tab to run the function ^R Tab to Tab Stop, which allows you to set any tab stops with M-X Edit Tab Stops (See section 11.3 [Indentation], page 48.). Features concerned with comments in programs are turned off except when explicitly invoked. Automatic display of parenthesis matching is turned off, which is what most people want. Finally, the syntax table is changed so that periods are not considered part of a word, while apostrophes, backspaces and underlines are.

If you are editing input for the text justifier TEX, you might want to use TEX mode instead of Text mode. See the file INFO:ETEX.INFO.

For SCRIBE input, use SCRIBE mode, which is like Text mode but recognizes SCRIBE comments and enables display of parenthesis matching. SCRIBE mode recognizes @BEGIN and @END lines as separating paragraphs but considers most other @-commands as ordinary text. If you have other lines which should separate paragraphs but do not start with @BEGIN or @END, put @; in front of them. For example,

```
@;@quotation{
This is some text that should be
filled by itself, not together with
the preceding or following text.
@;}
```

Someday there may be special major modes for other text justifiers.

11.1. Word Commands

EMACS has commands for moving over or operating on words. By convention, they are all Meta- characters.

M-F	Move Forward over a word.
M-B	Move Backward over a word.
M-D	Kill up to the end of a word.

M-Rubout	Kill back to the beginning of a word.
M-@	Mark the end of the next word.
M-T	Transpose two words; drag a word forward or backward across other words.

Notice how these commands form a group that parallels the character based commands C-F, C-B, C-D, C-T and Rubout. M-@ is related to C-@.

The commands Meta-F (^R Forward Word) and Meta-B (^R Backward Word) move forward and backward over words. They are thus analogous to Control-F and Control-B, which move over single characters. Like their Control- analogues, Meta-F and Meta-B move several words if given an argument. Meta-F with a negative argument moves backward like Meta-B, and Meta-B with a negative argument moves forward. Forward motion stops right after the last letter of the word, while backward motion stops right before the first letter.

It is easy to kill a word at a time. Meta-D (^R Forward Kill Word) kills the word after point. To be precise, it kills everything from point to the place Meta-F would move to. Thus, if point is in the middle of a word, only the part after point is killed. If some punctuation comes after point and before the next word, it is killed along with the word. If you wish to kill only the next word but not the punctuation, simply do Meta-F to get the end, and kill the word backwards with Meta-Rubout. Meta-D takes arguments just like Meta-F.

Meta-Rubout (^R Backward Kill Word) kills the word before point. It kills everything from point back to where Meta-B would move to. If point is after the space in "FOO, BAR", "FOO, " is killed. In such a situation, to avoid killing the comma and space, do a Meta-B and a Meta-D instead of a Meta-Rubout.

Meta-T (^R Transpose Words) moves the cursor forward over a word, dragging the word preceding or containing the cursor forward as well. A numeric argument serves as a repeat count. A negative argument undoes the effect of a positive argument; it drags the word behind the cursor backward over a word. An argument of zero, instead of doing nothing, transposes the word at point with the word at mark. In any case, the delimiter characters between the words do not move. For example, "FOO, BAR" transposes into "BAR, FOO" rather than "BAR FOO,".

To operate on the next n words with an operation which applies between point and mark, you can either set the mark at point and then move over the words, or you can use the command Meta-@ (^R Mark Word) which does not move point, but sets the mark where Meta-F would move to. It can be given arguments just like Meta-F. The case conversion operations have alternative forms that apply to words, since they are particularly useful that way.

Note that if you are in Atom Word mode and in Lisp mode, all the word commands regard an entire Lisp atom as a single word. See section 22.1 [Minor Modes], page 107.

The word commands' understanding of syntax is completely controlled by the syntax table. Any character can, for example, be declared to be a word delimiter. See section 22.4 [Syntax], page 111.

11.2. Sentence and Paragraph Commands

The EMACS commands for manipulating sentences and paragraphs are mostly Meta- commands, so as to resemble the word-handling commands.

M-A Move back to the beginning of the sentence.
M-E Move forward to the end of the sentence.
M-K Kill this or next sentence.
M-[Move back to previous paragraph beginning.
M-] Move forward to next paragraph end.
M-H Put point and mark around this paragraph (around the following one, if between paragraphs).
C-X Rubout
Kill back to beginning of sentence.

11.2.1. Sentences

The commands Meta-A and Meta-E (^R Backward Sentence and ^R Forward Sentence) move to the beginning and end of the current sentence, respectively. They were chosen to resemble Control-A and Control-E, which move to the beginning and end of a line, but unlike those Control characters Meta-A and Meta-E if repeated move over several sentences. EMACS considers a sentence to end wherever there is a ".", "?" or "!" followed by the end of a line or two spaces, with any number of ")"'s, "]"'s, "'"'s, or '"' 's allowed in between. Neither M-A nor M-E moves past the CRLF or spaces which delimit the sentence.

Just as C-A and C-E have a kill command, C-K, to go with them, so M-A and M-E have a corresponding kill command M-K (^R Kill Sentence) which kills from point to the end of the sentence. With minus one as an argument it kills back to the beginning of the sentence. Larger arguments serve as a repeat count.

There is a special command, C-X Rubout (^R Backward Kill Sentence) for killing back to the beginning of a sentence, because this is useful when you change your mind in the middle of composing text.

11.2.2. Paragraphs

There are similar commands for moving over paragraphs. Meta-[(^R Backward Paragraph) moves to the beginning of the current or previous paragraph, while Meta-] (^R Forward Paragraph) moves to the end of the current or next paragraph. Blank lines and text justifier command lines separate paragraphs and are not part of any paragraph. Also, an indented line starts a new paragraph.

In major modes for programs (as opposed to Text mode), paragraphs are determined only by blank lines. This makes the paragraph commands continue to be useful even though there are no paragraphs per se.

When there is a fill prefix, then paragraphs are delimited by all lines which don't start with the fill prefix. See section 11.4 [Filling], page 50.

When you wish to operate on a paragraph, you can use the command Meta-H

(^R Mark Paragraph) to prepare. This command puts point at the beginning and mark at the end of the paragraph point was in. Before setting the new mark at the end, a mark is set at the old location of point; this allows you to undo a mistaken Meta-H with two C-U C-@'s. If point is between paragraphs (in a run of blank lines, or at a boundary), the paragraph following point is surrounded by point and mark. Thus, for example, Meta-H C-W kills the paragraph around or after point.

One way to make an "invisible" paragraph boundary that does not show if the file is printed is to put space-backspace at the front of a line. The space makes the line appear (to the EMACS paragraph commands) to be indented, which usually means that it starts a paragraph.

The variable Paragraph Delimiter should be a TECO search string (See section 19.3 [TECO search strings], page 85.) composed of various characters or character sequences separated by ↑O's. A line whose beginning matches the search string is either the beginning of a paragraph or a text justifier command line part of no paragraph. If the line begins with period, singlequote, "-", "\" or "@", it can be a text justifier command line; otherwise, it can be the beginning of a paragraph; but it cannot be either one unless Paragraph Delimiter is set up to recognize it. Thus, ".↑O " as the Paragraph Delimiter string means that lines starting with spaces start paragraphs, lines starting with periods are text justifier commands, and all other nonblank lines are nothing special.

11.3. Indentation Commands for Text

Tab	Indents "appropriately" in a mode-dependent fashion.
M-Tab	Inserts a tab character.
Linefeed	Is the same as Return followed by Tab.
M-^	Undoes a Linefeed. Merges two lines.
M-M	Moves to the line's first nonblank character.
M-I	Indent to tab stop. In Text mode, Tab does this also.
C-M-\	Indent several lines to same column.
C-X Tab	Shift block of lines rigidly right or left.

The way to request indentation is with the Tab command. Its precise effect depends on the major mode. In Text mode, it indents to the next tab stop. You can set the tab stops with Edit Tab Stops (see below). If you just want to insert a tab character in the buffer, you can use M-Tab or C-Q Tab.

For English text, usually only the first line of a paragraph should be indented. So, in Text mode, new lines created by Auto Fill mode are not indented. Text mode tells Auto Fill mode not to indent new lines by setting the variable Space Indent Flag to zero.

But sometimes you want to have an indented paragraph. In such cases, use M-X Edit Indented Text, which enters a submode in which Tab and Auto Fill indent each line under the previous line, and only blank lines delimit paragraphs. Alternatively, you can specify a fill prefix (see below).

To undo a line-break, whether done manually or by Auto Fill, use the Meta-^ (^R Delete Indentation) command to delete the indentation at the front of the current

line, and the line boundary as well. They are replaced by a single space, or by no space if before a ")" or after a "(", or at the beginning of a line. To delete just the indentation of a line, go to the beginning of the line and use Meta-\ (^R Delete Horizontal Space), which deletes all spaces and tabs around the cursor.

To insert an indented line before the current line, do C-A, C-O, and then Tab. To make an indented line after the current line, use C-E Linefeed.

To move over the indentation on a line, do Meta-M or C-M-M (^R Back to Indentation). These commands, given anywhere on a line, position the cursor at the first nonblank character on the line.

There are also commands for changing the indentation of several lines at once. Control-Meta-\ (^R Indent Region) gives each line whose first character is between point and mark the "usual" indentation (as determined by Tab). With a numeric argument, it gives each line precisely that much indentation. C-X Tab (^R Indent Rigidly) moves all of the lines in the region right by its argument (left, for negative arguments).

Usually, EMACS uses both tabs and spaces to indent. If you don't want that, you can use M-X Indent Tabs Mode to turn the use of tabs on or off. To convert all tabs in a file to spaces, you can use M-X Untabify, whose argument is the number of positions to assume between tab stops (default is 8). Arguments other than 8 are useful in processing files transported from systems which use other tab stops so that they look the way they are supposed to. M-X Tabify performs the opposite transformation, replacing spaces with tabs whenever possible, but only if there are at least three of them so as not to obscure ends of sentences. The visual appearance of the text should never be changed by Tabify or Untabify unless you specify an argument other than 8.

11.3.1. Tab Stops

For typing in tables, you can use Text mode's definition of Tab, ^R Tab to Tab Stop, which may be given anywhere in a line, and indents from there to the next tab stop. If you are not in Text mode, this function can be found on M-I anyway.

Set the tab stops using Edit Tab Stops, which displays for you a buffer whose contents define the tab stops. Here is what it would look like for ordinary tab stops every eight columns (truncated to fit the manual).

```
        :       :       :       :       :       :

 123456789 123456789 123456789 123456789 123456789 1234
0         10        20        30        40        50
```

The first line contains a colon or period at each tab stop. Colon indicates an ordinary tab, which fills with whitespace; a period specifies that characters be copied from the corresponding columns of the second line below it. Thus, you can tab to a column automatically inserting dashes or periods, etc. It is your responsibility to put in the second line the text to be copied. In the example above there are no periods, and the second line is not used, and is left blank.

The third and fourth lines you see contain column numbers to help you edit. They are only there while you are editing the tab stops; they are not really part of the tab settings. The first two lines reside in the variable Tab Stop Definitions when they are not being edited. If the second line is not needed, Tab Stop Definitions can be just one line, with no CRLFs. This makes it easier to set the variable in a local modes list. See section 22.7 [Locals], page 118.

11.4. Text Filling

Space	in Auto Fill mode, breaks lines when appropriate.
M-Q	Fill paragraph.
M-G	Fill region (G is for Grind, by analogy with Lisp).
M-S	Center a line.
C-X =	Show current cursor position.

Auto Fill mode lets you type in text that is *filled* (broken up into lines that fit in a specified width) as you go. If you alter existing text and thus cause it to cease to be properly filled, EMACS can fill it again if you ask.

Entering Auto Fill mode is done with M-X Auto Fill. From then on, lines are broken automatically at spaces when they get longer than the desired width. New lines are usually indented, but in Text mode they are not. To leave Auto Fill mode, execute M-X Auto Fill again. When Auto Fill mode is in effect, the word "Fill" appears in the mode line.

When you finish a paragraph, you can type Space with an argument of zero. This doesn't insert any spaces, but it does move the last word of the paragraph to a new line if it doesn't fit in the old line. Return also moves the last word, but it may create another blank line.

If you edit the middle of a paragraph, it may no longer be correctly filled. To re-fill a paragraph, use the command Meta-Q (^R Fill Paragraph). It causes the paragraph that point is inside, or the one after point if point is between paragraphs, to be re-filled. All the line-breaks are removed, and then new ones are inserted where necessary. M-Q can be undone with M-X Undo (See section 24.3 [Undo], page 128.).

If you are not happy with Meta-Q's idea of where paragraphs start and end (the same as Meta-H's. See section 11.2 [Paragraphs], page 47.), you can use Meta-G (^R Fill Region) which re-fills everything between point and mark. Sometimes, it is ok to fill a region of several paragraphs at once. Meta-G recognizes a blank line or an indented line as starting a paragraph and does not fill it in with the preceding line. The sequence space-backspace at the front of a line will prevent it from being filled into the preceding line but is invisible when the file is printed. However, the full sophistication of the paragraph commands in recognizing paragraph boundaries is not available. The purpose of M-G is to allow you to override EMACS's usual criteria for paragraph boundaries. M-G can be undone with M-X Undo.

Giving an argument to M-G or M-Q causes the text to be *justified* instead of filled. This means that extra spaces are inserted between the words so as to make the right margin come out exactly even. I do not recommend doing this. If someone else has

uglified some text by justifying it, you can unjustify it (remove the spaces) with M-G or M-Q without an argument.

The command Meta-S (^R Center Line) centers a line within the current line width. With an argument, it centers several lines individually and moves past them.

The maximum line width for filling is in the variable Fill Column. Both M-Q and Auto Fill make sure that no line exceeds this width. The easiest way to set the variable is to use the command C-X F (^R Set Fill Column) which places the margin at the column point is on, or wherever you specify with a numeric argument. The fill column is initially column 70.

To fill a paragraph in which each line starts with a special marker (which might be a few spaces, giving an indented paragraph), use the *fill prefix* feature. Move point to a spot right after the special marker and give the command C-X Period (^R Set Fill Prefix). Then, filling the paragraph will remove the marker from each line beforehand, and put the marker back in on each line afterward. Auto Fill when there is a fill prefix inserts the fill prefix at the front of each new line. Also, any line which does not start with the fill prefix is considered to start a paragraph. To turn off the fill prefix, do C-X Period with point at the front of a line. The fill prefix is kept in the variable Fill Prefix.

The command C-X = (What Cursor Position) can be used to find out the column that the cursor is in, and other miscellaneous information about point which is quick to compute. It prints a line in the echo area that looks like this:

```
X=5 Y=7 CH=101 .=3874(35% of 11014) H=<3051,4640>
```

In this line, the X value is the column the cursor is in (zero at the left), the Y value is the screen line that the cursor is in (zero at the top), the CH value is the octal value of the character after point (101 is "A"), the "point" value is the number of characters in the buffer before point, and the values in parentheses are the percentage of the buffer before point and the total size of the buffer.

The H values are the virtual buffer boundaries, indicate which part of the buffer is still visible when narrowing has been done. If you have not done narrowing, the H values are omitted. For more information about the virtual buffer boundaries, See section 17 [Narrowing], page 77.

11.5. Case Conversion Commands

EMACS has commands for converting either a single word or any arbitrary range of text to upper case or to lower case.

M-L	Convert following word to lower case.
M-U	Convert following word to upper case.
M-C	Capitalize the following word.
C-X C-L	Convert region to lower case.
C-X C-U	Convert region to upper case.

The word conversion commands are the most useful. Meta-L (^R Lowercase Word) converts the word after point to lower case, moving past it. Thus, successive Meta-L's convert successive words. Meta-U (^R Uppercase Word) converts to all capitals

instead, while Meta-C (^R Uppercase Initial) puts the first letter of the word into upper case and the rest into lower case. All these commands convert several words at once if given an argument. They are especially convenient for converting a large amount of text from all upper case to mixed case, because you can move through the text using M-L, M-U or M-C on each word as appropriate.

When given a negative argument, the word case conversion commands apply to the appropriate number of words before point, but do not move point. This is convenient when you have just typed a word in the wrong case. You can give the case conversion command and continue typing.

If a word case conversion command is given in the middle of a word, it applies only to the part of the word which follows the cursor, treating it as a whole word.

The other case conversion commands are C-X C-U (^R Uppercase Region) and C-X C-L (^R Lowercase Region), which convert everything between point and mark to the specified case. Point and mark do not move. These commands ask for confirmation if the region contains more than Region Query Size characters; they also save the original contents of the region so you can undo them (See section 24.3 [Undo], page 128.).

11.6. Dissociated Press

M-X Dissociated Press is a command for scrambling a file of text either word by word or character by character. Starting from a bufferfull of straight English, it produces extremely amusing output. Dissociated Press prints its output on the terminal. It does not change the contents of the buffer.

Dissociated Press operates by jumping at random from one point in the buffer to another. In order to produce plausible output rather than gibberish, it insists on a certain amount of overlap between the end of one run of consecutive words or characters and the start of the next. That is, if it has just printed out "president" and then decides to jump to a different point in the file, it might spot the "ent" in "pentagon" and continue from there, producing "presidentagon". Long sample texts produce the best results.

A negative argument to M-X Dissociated Press tells it to operate character by character, and specifies the number of overlap characters. A positive argument tells it to operate word by word and specifies the number of overlap words. In this mode, whole words are treated as the elements to be permuted, rather than characters. No argument is equivalent to an argument of two. For your againformation, the output is only printed on the terminal. The file you start with is not changed.

Dissociated Press produces nearly the same results as a Markhov chain based on a frequency table constructed from the sample text. It is, however, an independent, ignoriginal invention. Dissociated Press techniquitously copies several consecutive characters from the sample between random choices, whereas a Markhov chain would choose randomly for each word or character. This makes for more plausible sounding results.

It is a mustatement that too much use of Dissociated Press can be a developediment

to your real work. Sometimes to the point of outragedy. And keep dissociwords out of your documentation, if you want it to be well userenced and properbose. Have fun. Your buggestions are welcome.

Chapter Twelve

Commands for Fixing Typos

In this section we describe the commands that are especially useful for the times when you catch a mistake in your text just after you have made it, or change your mind while composing text on line.

Rubout	Delete last character.
M-Rubout	Kill last word.
C-X Rubout	Kill to beginning of sentence.
C-T	Transposes two characters.
C-X C-T	Transposes two lines.
C-X T	Transposes two arbitrary regions.
M-Minus M-L	Convert last word to lower case.
M-Minus M-U	Convert last word to all upper case.
M-Minus M-C	Convert last word to lower case with capital initial.
M-'	Fix up omitted shift key on digit.

12.1. Killing Your Mistakes

The Rubout command is the most important correction command. When used among printing (self-inserting) characters, it can be thought of as canceling the last character typed.

When your mistake is longer than a couple of characters, it might be more convenient to use M-Rubout or C-X Rubout. M-Rubout kills back to the start of the last word, and C-X Rubout kills back to the start of the last sentence. C-X Rubout is particularly useful when you are thinking of what to write as you type it, in case you change your mind about phrasing. M-Rubout and C-X Rubout save the killed text for C-Y and M-Y to retrieve (See section 9.2 [Un-killing], page 39.).

M-Rubout is often useful even when you have typed only a few characters wrong, if you know you are confused in your typing and aren't sure exactly what you typed. At such a time, you cannot correct with Rubout except by looking at the screen to see what you did. It requires less thought to kill the whole word and start over again, especially if the system is heavily loaded.

12.2. Transposition

The common error of transposing two characters can be fixed, when they are adjacent, with the C-T command. Normally, C-T transposes the two characters on either side of the cursor. When given at the end of a line, rather than transposing the last character of the line with the line separator, which would be useless, C-T transposes the last two characters on the line. So, if you catch your transposition error right away, you can fix it with just a C-T. If you don't catch it so fast, you must move the cursor back to between the two transposed characters. If you transposed a space with the last character of the word before it, the word motion commands are a good way of getting there. Otherwise, a reverse search (C-R) is often the best way. See section 10 [Search], page 43.

To transpose two lines, use the C-X C-T command (^R Transpose Lines). M-T transposes words and C-M-T transposes s-expressions.

A more general transpose command is C-X T (^R Transpose Regions). This transposes two arbitrary blocks of text, which need not even be next to each other. To use it, set the mark at one end of one block, then at the other end of the block; then go to the other block and set the mark at one end, and put point at the other. In other words, point and the last three marks should be at the four locations which are the ends of the two blocks. It does not matter which of the four locations point is at, or which order the others were marked. C-X T transposes the two blocks of text thus identified, and relocates point and the three marks without changing their order.

12.3. Case Conversion

A very common error is to type words in the wrong case. Because of this, the word case-conversion commands M-L, M-U and M-C have a special feature when used with a negative argument: they do not move the cursor. As soon as you see you have mistyped the last word, you can simply case-convert it and go on typing. See section 11.5 [Case], page 51.

Another common error is to type a special character and miss the shift key, producing a digit instead. There is a special command for fixing this: M-' (^R Upcase Digit), which fixes the last digit before point in this way (but only if that digit appears on the current line or the previous line. Otherwise, to minimize random effects of accidental use, M-' does nothing). Once again, the cursor does not move, so you can use M-' when you notice the error and immediately continue typing. Because M-' needs to know the arrangement of your keyboard, the first time you use it you must supply the information by typing the row of digits 1, 2, ... , 9, 0 but *holding down the shift key*. This tells M-' the correspondence between digits and special characters, which is remembered for the duration of the EMACS. This command is called M-' because its main use is to replace "7" with a single-quote.

Chapter Thirteen

File Handling

The basic unit of stored data is the file. Each program, each paper, lives usually in its own file. To edit a program or paper, the editor must be told the name of the file that contains it. This is called *visiting* the file. To make your changes to the file permanent on disk, you must *save* the file. EMACS also has facilities for deleting files conveniently, and for listing your file directory. Special text in a file can specify the modes to be used when editing the file.

13.1. Visiting Files

C-X C-V	Visit a file.
C-X C-R	Visit a file for reading only.
C-X C-Q	Change regular visiting to read only, or vice versa.
C-X C-S	Save the visited file.
Meta-~	Tell EMACS to forget that the buffer has been changed.

Visiting a file means copying its contents into EMACS where you can edit them. EMACS remembers the name of the file you visited. Unless you use the multiple buffer or window features of EMACS, you can only be visiting one file at a time. The name of the file you are visiting in the currently selected buffer is visible in the mode line when you are at top level.

The changes you make with EMACS to the text of the file you are visiting are made not in the file itself, but in a copy inside EMACS. The file itself is not changed. The changed text is not permanent until you save it in a file. The first time you change the text, a star appears at the end of the mode line; this indicates that the text contains fresh changes which will be lost unless you save them. You can do that at any time with C-X C-S. If you change one file and then try to visit another in the same buffer, EMACS offers to save the first file (if it is not saved, the changes are lost). In addition, for those who are afraid of system crashes, Auto Save mode saves the file at regular intervals automatically while you edit. See section 13.3 [Auto Save], page 59. Journal files are another way of protecting against crashes. See section 24.4 [Journals], page 129.

To visit a file, use the command C-X C-V (^R Visit File). Follow the command with the name of the file you wish to visit, terminated by a Return. If you can see a filename in the mode line, then that name is the default, and any component of the filename which you don't specify is taken from it. If EMACS thinks you can't see the defaults,

they are included in the prompt. You can abort the command by typing C-G, or edit the filename with the standard Twenex editing and recognition commands (Rubout, C-W, C-U, C-F and Altmode). If you do type a Return to finish the command, the new file's text appears on the screen, and its name shows up in the mode line.

When you wish to save the file and make your changes permanent, type C-X C-S (^R Save File). After the save is finished, C-X C-S prints "Written: <filenames>" in the echo area at the bottom of the screen. If there are no changes to save (no star at the end of the mode line), the file is not saved; it would be redundant to save a duplicate of the previous version.

However, you need not do the saves yourself. If you alter one file and then visit another, EMACS offers to save the old one. If you answer Y, the old file is saved; if you answer N, all the changes you have made to it since the last save are lost. You should not type ahead after a file visiting command, because your type-ahead might answer an unexpected question in a way that you would regret. If you are sure you only want to look at a file, and not change it, you can use the C-X C-R command to visit it, instead of C-X C-V. If a file was visited with C-X C-R, EMACS does not offer to save it when you visit the next file. It assumes the changes were inadvertent. However, you can still save the file with C-X C-S. The command C-X C-Q (^R Do Not Write File) can be used to switch between these two policies on saving. With no argument, it says that the file should not be saved if another is visited. With an argument, it says that the file should be saved.

If EMACS is about to save a file automatically and discovers that the text is now a lot shorter than it used to be, it tells you so and asks for confirmation (Y or N). If you aren't sure what to answer (because you are surprised that it has shrunk), type C-G to abort everything, and take a look at your buffer.

Sometimes you will change a buffer by accident. Even if you undo the change (perhaps, rub out the character you inserted), EMACS still knows that "the buffer has been changed". You can tell EMACS to forget about that with the Meta-~ (^R Buffer Not Modified) command. This command simply clears the "modified" flag which says that the buffer contains changes which need to be saved. It is up to you not to use it unwisely. If we take "~" to mean "not", then Meta-~ is "not" metafied.

If there are still people using EDIT or SOS on your machine, you may have to visit files with line numbers in them. The function Strip SOS Line Numbers removes all line numbers from the current buffer. It also removes all null (↑@) characters. An explicit argument inhibits removal of nulls unless the file actually has line numbers.

What if you want to create a file? Just visit it. EMACS prints "(New File)" but otherwise acts unworried. If you make any changes and save them, the file is created. If you visit a nonexistent file unintentionally (because you typed the wrong file name), visit the file you meant. If you didn't "change" the nonexistent file (you never inserted anything in it), it is not created.

If EMACS is about to save a file and sees that the date of the latest version on disk does not match what EMACS last read or wrote, EMACS notifies you of this fact, and asks what to do, because this probably means that something is wrong. For example, someone else may have been editing the same file. If this is so, there is a good chance that your work or his work will be lost if you don't take the proper steps. You

should first find out exactly what is going on. The C-X C-D command to list the directory will help. If you determine that someone else has modified the file, save your file under different names (or at least making a new version) and then SRCCOM the two files to merge the two sets of changes. Also get in touch with the other person so that he doesn't continue editing.

13.2. How to Undo Drastic Changes to a File

If you have made extensive changes to a file and then change your mind about them, you can get rid of them by reading in the previous version of the file. To do this, use M-X Revert File. If you have been using Auto Save mode, it reads in the last version of the visited file or the last auto save file, whichever is more recent.

In Auto Save mode, saving under special Auto Save filenames, then you can ask to revert to the last "real" save, ignoring subsequent auto saves, with C-U M-X Revert File. If you are using the style of auto saving which saves under the real filenames, this is not possible.

M-X Revert File does not change point, so that if the file was only edited slightly, you will be at approximately the same piece of text after the Revert as before. If you have made drastic changes, the same value of point in the old file may address a totally different piece of text.

Because M-X Revert File can be a disaster if done by mistake, it asks for confirmation (Y or N) before doing its work. A pre-comma argument can be used to inhibit the request for confirmation when you call the function Revert File from a TECO program, as in 1,M(M.M Revert_File♦).

13.3. Auto Save Mode: Protection Against Disasters

In Auto Save mode, EMACS saves your file from time to time (based on counting your commands) without being asked. Your file is also saved if you stop typing for more than a few minutes when there are changes in the buffer. This prevents you from losing more than a limited amount of work in a disaster. (Another method of protection is the journal file. See section 24.4 [Journals], page 129.).

You can turn auto saving on or off in an individual buffer with M-X Auto Save. In addition, you can have auto saving by default in all buffers by setting the option Auto Save Default. The frequency of saving, and the number of saved versions to keep, can both be specified.

Each time you visit a file, no matter how, auto saving will be on for that file if Auto Save Default is nonzero. However, by giving a nonzero argument to the file-visiting command, you can turn off auto saving *for that file only*, without changing the default. For example, you might use C-U C-X C-V to do this. Once you have visited a file, you can turn auto saving on or off with M-X Auto Save. Like other minor mode commands, M-X Auto Save turns the mode on with a positive argument, off with a zero or negative argument; with no argument, it toggles. If you start typing a new file into a buffer

without visiting anything, Auto Save mode is initially off, but you can turn it on with M-X Auto Save.

When an auto save happens, "(Auto Save)" is printed in the echo area (On a printing terminal, the bell is rung instead). An error in the process of auto saving prints "(Auto Save Error!)".

Let us suppose that it is time for an automatic save to be done: where should the file be saved?

Two workable methods have been developed: save the file under the names you have visited, or save it under some special "Auto Save file name". Each solution has its good and bad points. The first one is excellent some of the time, but intolerable the rest of the time. The second is usually acceptable. Auto saving under the visited file's actual names means that you need do nothing special to gobble the auto save file when you need it; and it means that there is no need to worry about interference between two users sharing a directory, as long as they aren't editing the same file at once. However, this method can sometimes have problems:

> If you visit a file with C-X C-R, then you have said you don't want to store under those names.
>
> If you have visited a fixed version, auto saves can't go under that name, because they would clobber the original file.
>
> If you haven't visited a file, there aren't any names to use.

In all these cases, the filenames for auto saving are taken from the variable Auto Save Filenames. If none of those cases apply then it is possible to store auto saves under the visited name. This will be done, provided that you turn on the feature by setting the variable Auto Save Visited File to a nonzero value.

When you want to save your file "for real", use C-X C-S, as always. C-U C-X C-S is a way to request an "auto" save explicitly. When you are auto saving under the visited filenames, there is not much difference between an auto save and a "real" save, except that an auto save will eventually be deleted automatically by EMACS a few auto saves later, while a "real" save will be left around forever (at least, Auto Save won't delete it).

When it is time to recover from a system crash by reloading the auto save file, if auto saving was using the visited file names you have nothing special to do. If auto saving was using special Auto Save filenames, read in the last auto save file and then use C-X C-W (Write File) to write it out in its real location. If you want to use an auto save file to throw away changes that you don't like, you can use M-X Revert File, which knows how to find the most recent save, permanent or not, under whatever filenames. See section 13.2 [Revert], page 59.

For your protection, if a file has shrunk by more than 30% since the last save, auto saving does not save. Instead it prints a message that the file has shrunk. You can save explicitly if you wish; after that, auto saving will resume.

Although auto saving generates large numbers of files, it does not clog directories, because it cleans up after itself. Only the last Auto Save Max auto save files are kept; as further saves are done, old auto saves are deleted (and expunged). However, files which were not made by auto saving (or by explicitly requested auto-saves with C-U

C-X C-S) are never deleted in this way. The variable Auto Save Max is initially 2. Changing the value may not take effect in a given buffer until you turn auto saving off and on in that buffer.

The number of characters of input between auto saves is controlled by the variable Auto Save Interval. It is initially 500. Changing this takes effect immediately.

Auto Save Filenames is usually set up by the default init file to <your directory>_^RSV... If you use auto saving in multiple buffers a lot, you might want to have a Buffer Creation Hook which sets Auto Save Filenames locally to a filename based on the buffer name, so that different buffers don't interfere with each other.

13.4. Listing a File Directory

To look at a part of a file directory, use the C-X C-D command (^R Directory Display). With no argument, it shows you the file you are visiting, and related files with the same first name. C-U C-X C-D reads a filename from the terminal and shows you the files related to that filename. The filename may contain wildcards.

To see the whole directory in a brief format, use the function List Files, which takes the directory name as a string argument. The function View Directory prints a verbose listing of a whole directory. These two commands take a filename as argument, which can include wild cards.

The variable Auto Directory Display can be set to make many file operations display the directory automatically. The variable is normally 0; making it positive causes write operations such as Write File to display the directory, and making it negative causes read operations such as Insert File or visiting to display it as well. The display is done using the default directory listing function which is kept in the variable Directory Lister. Normally this is the function & Subset Directory that displays only the files related to the current default file.

13.5. Cleaning a File Directory

The normal course of editing constantly creates new versions of files. If you don't eventually delete the old versions, the directory will fill up and further editing will be impossible. EMACS has commands that make it easy to delete the old versions.

For complete flexibility to delete precisely the files you want to delete, you can use the DIRED package. See section 13.6 [DIRED], page 62, for more details.

M-X Reap File and M-X Clean Dir are more convenient ways to do the usual thing: keep only the two (or other number) most recent versions.

M-X Reap File♦<file><cr> counts the number of versions of <file>. If there are more than two, you are told the names of the recent ones (to be kept) and the names of the older ones (to be deleted), and asked whether to do the deletion (answer Y or N).

Reap File makes a special offer to delete individual files whose extension indicates that they are likely to be temporary. The list of temporary names is contained in a

TECO search string in the variable Temp File FN2 List. See section 19.3 [TECO search strings], page 85.

If you give M-X Reap File a null filename argument, or no argument, then it applies to the file you are visiting.

M-X Clean Directory↑<dirname> <cr> cleans a whole directory of old versions. Each file in the directory is processed a la M-X Reap File. M-X Clean Dir with a null argument, or no argument, cleans the directory containing the file you are visiting.

M-X Reap File and M-X Clean Dir can be given a numeric argument which specifies how many versions to keep. For example, C-U 4 M-X Reap File would keep the four most recent versions. The default when there is no argument is the value of the variable File Versions Kept, which is initially 2.

To expunge the files deleted by Reap File or Clean Directory, use M-X Expunge Directory, which expunges the connected directory. If you wish to expunge some other directory, connect to it first with

```
M-X Connect to Directory↑<directory>↑<password><cr>
```

You don't have to specify the password if you can connect without one.

13.6. DIRED, the Directory Editor Subsystem

DIRED makes it easy to delete many of the files in a single directory at once. It presents a copy of a listing of the directory, which you can move around in, marking files for deletion. When you are satisfied, you can tell DIRED to go ahead and delete the marked files.

Invoke DIRED with M-X DIRED to edit the current default directory, or M-X DIRED↑<dir><cr> to edit directory <dir>. You are then given a listing of the directory which you can move around in with all the normal EMACS motion commands. Som EMACS commands are made illegal and others do special things, but it's still a recursive editing level which you can exit normally with C-M-Z and abort with C-].

You can mark a file for deletion by moving to the line describing the file and typing D, C-D, K, or C-K. The deletion mark is visible as a D at the beginning of the line. Point is moved to the beginning of the next line, so that several D's delete several files. Alternatively, if you give D an argument it marks that many consecutive files. Given a negative argument, it marks the preceding file (or several files) and puts point at the first (in the buffer) line marked. Most of the DIRED commands (D, U, E, Space) repeat this way with numeric arguments.

If you wish to remove a deletion mark, use the U (for Undelete) command, which is invoked like D: it removes the deletion mark from the current line (or next few lines, if given an argument). The Rubout command removes the deletion mark from the previous line, moving up to that line. Thus, a Rubout after a D precisely cancels the D.

For extra convenience, Space is made a command similar to C-N. Moving down a line is done so often in DIRED that it deserves to be easy to type. Rubout is often useful simply for moving up.

If you are not sure whether you want to delete a file, you can examine it by typing E. This enters a recursive editing mode on the file, which you can exit with C-M-Z. The file is not really visited at that time, and you are not allowed to change it. When you exit the recursive editing level, you return to DIRED. The V command is like E but uses View File to look at the file.

When you have marked the files you wish to mark, you can exit DIRED with C-M-Z. If any files were marked for deletion, DIRED lists them in a concise format, several per line. Then DIRED asks for confirmation of the list. You can type "YES" (Just "Y" won't do) to go ahead and delete them, "N" to return to editing the directory so you can change the marks, or "X" to give up and delete nothing. No Return character is needed. No other inputs are accepted at this point.

13.6.1. Other DIRED Commands

N finds the next "hog": the next file which has at least three versions (or, more than File Versions Kept).

C calls up SRCCOM as an inferior with the current file in its command line. When you return to EMACS, the cursor moves down a line to the next file.

S sorts the files into a different order. It reads another character to say which order: F for filename (the default), S for size, R for read date, or W for write date.

R does the same sorting as S, but uses the reverse order (small files, older files or end of alphabet first).

H helps you clean up. It marks "old" versions of the current file, and versions with "temporary" second file names, for deletion. You can then use the D and U commands to add and remove marks before deleting the files. The variables File Versions Kept and Temp File FN2 List control which files H picks for deletion. With an argument (C-U H), it does the whole directory instead of just the current file.

? displays a list of the DIRED commands.

13.6.2. Invoking DIRED

There are some other ways to invoke DIRED. The Emacs command C-X D (^R Dired) puts you in DIRED on the directory containing the file you are currently editing. With a numeric argument of 1 (C-U 1 C-X D), only the current file is displayed instead of the whole directory. In combination with the H command this can be useful for cleaning up excess versions of a file after a heavy editing session. With a numeric argument of 4 (C-U C-X D), it asks you for the directory name. Type a directory name and/or a file name. If you explicitly specify a file name only versions of that file are displayed, otherwise the whole directory is displayed.

13.6.3. Editing the DIRED Buffer Yourself

It is unwise to try to edit the text of the directory listing yourself, without using the special DIRED commands, unless you know what you are doing, since you can confuse DIRED that way. To make it less likely that you will do so accidentally, the self-inserting characters are all made illegal inside DIRED. However, deleting whole lines at a time is certainly safe. This does not delete the files described by those lines; instead, it makes DIRED forget that they are there and thus makes sure they will *not* be deleted. Thus, M-X Keep Lines♦ is useful if you wish to delete only files with a FOO in their names. See section 19 [Replacement], page 83.

For more complicated things, you can use the minibuffer. When you call the minibuffer from within DIRED, you get a perfectly normal one. The special DIRED commands are not present while you are editing in the minibuffer. To mark a file for deletion, replace the space at the beginning of its line with a "D". To remove a mark, replace the "D" with a space.

13.7. Miscellaneous File Operations

EMACS has extended commands for performing many other operations on files. Invoking these commands with C-M-X instead of M-X will allow you to use filename completion on the filename arguments these commands require.

M-X View File♦ <file> <cr> allows you to scan or read a file by sequential screenfuls without visiting the file. It enters a subsystem in which you type a Space to see the next screenful or a Backspace to see the previous screenful. Typing anything else exits the command. View File does not visit the file; it does not alter the contents of any buffer. The advantage of View File is that the whole file does not need to be loaded before you can begin reading it. The inability to do anything but page forward or backward is a consequence.

M-X Write File♦ <file> <cr> writes the contents of the buffer into the file <file>, and then visits that file. It can be thought of as a way of "changing the name" of the file you are visiting. Unlike C-X C-S, Write File saves even if the buffer has not been changed. C-X C-W is another way of getting at this command.

M-X Insert File♦ <file> <cr> inserts the contents of <file> into the buffer at point, leaving point unchanged before the contents and mark after them. The current defaults are used for <file>, and are updated.

M-X Write Region♦ <file> <cr> writes the region (the text between point and mark) to the specified file. It does not set the visited filenames. The buffer is not changed.

M-X Append to File♦ <file> <cr> appends the region to <file>. The text is added to the end of <file>.

M-X Prepend to File♦ <file> <cr> adds the text to the beginning of <file> instead of the end.

M-X Set Visited Filename♦<file><cr> changes the name of the file being visited without reading or writing the data in the buffer. M-X Write File is equivalent to this command followed by a C-X C-S.

M-X Delete File♦<file><cr> deletes the file.

M-X Copy File♦<old file>♦<new file><cr> copies the file.

M-X Rename File♦<old name>♦<new name><cr> renames the file.

The default filenames for all of these operations are *TECO default filenames*. Most of these operations also leave the TECO default names set to the file they operated on. The TECO default is *not always* the same as the file you are visiting. When you visit a file, they start out the same; the commands mentioned above change the TECO default, but do not change the visited filenames. Each buffer has its own TECO default filenames.

The operation of visiting a file is available as a function under the name M-X Visit File♦<file>♦. In this form, it uses the TECO default as its defaults, though it still sets both the TECO default and the visited filenames.

Chapter Fourteen

Using Multiple Buffers

When we speak of "the buffer", which contains the text you are editing, we have given the impression that there is only one. In fact, there may be many of them, each with its own body of text. At any time only one buffer can be *selected* and available for editing, but it isn't hard to switch to a different one. Each buffer individually remembers which file it is visiting, what modes are in effect, and whether there are any changes that need saving.

C-X B	Select or create a buffer.
C-X C-F	Visit a file in a new buffer.
C-X C-B	List the existing buffers.
C-X K	Kill a buffer.

Each buffer in EMACS has a single name, which normally doesn't change. A buffer's name can be any length. The name of the currently selected buffer, and the name of the file visited in it, are visible in the mode line when you are at top level. A newly started EMACS has only one buffer, named "Main".

As well as the visited file and the major mode, a buffer can, if ordered to, remember many other things *locally*, which means, independently of all other buffers. See section 22.3 [Variables], page 109.

14.1. Creating and Selecting Buffers

To create a new buffer, you need only think of a name for it (say, "FOO") and then do C-X B FOO<cr>, which is the command C-X B (Select Buffer) followed by the name. This makes a new, empty buffer and selects it for editing. The new buffer is not visiting any file, so if you try to save it you will be asked for the filenames to use. Each buffer has its own major mode; the new buffer's major mode is taken from the value of the variable Default Major Mode, or from the major mode of the previously selected buffer if that variable is the null string. Normally this is Fundamental mode.

To return to buffer FOO later after having switched to another, the same command C-X B FOO<cr> is used, since C-X B can tell whether a buffer named FOO exists already or not. It does not matter whether you use upper case or lower case in typing the name of a buffer. C-X B Main<cr> reselects the buffer Main that EMACS started out with. Just C-X B<cr> reselects the previous buffer. Repeated C-X B<cr>'s alternate between the last two buffers selected.

You can also read a file into its own newly created buffer, all with one command: C-X C-F (Find File), followed by the filename. The first name of the file becomes the buffer name. C-F stands for "Find", because if the specified file already resides in a buffer in your EMACS, that buffer will be reselected. So you need not remember whether you have brought the file in already or not. A buffer created by C-X C-F can be reselected later with C-X B or C-X C-F, whichever you find more convenient. Nonexistent files can be created with C-X C-F just as they can be with C-X C-V.

Sometimes EMACS needs to visit a file as part of some other operation. By default, it visits the file in whatever buffer was selected. If you like to use C-X C-F and multiple buffers, you can tell EMACS to use multiple buffers for implicit visiting by setting the variable TAGS Find File to a nonzero value. This causes automatic visiting to be done by means of C-X C-F instead of C-X C-V. Automatic visiting is done by the TAGS package (See section 21 [TAGS], page 99.) and by invoking EMACS with a filename

```
@EMACS <filename><cr>
```

If the buffer with the same name that C-X C-F wants to use already exists but with the wrong contents (often a different file with a similar name), then you are asked what to do. You can type Return meaning go ahead and reuse that buffer for this new file, or you can type another buffer name to use instead. If C-X C-F does find the file already in a buffer, then it checks to see whether the version on disk is the same as the last version read or written from that buffer, for safety. If they are different, you are warned that someone else may be editing the file, and left with the version which was already in the EMACS. To get the new version from disk instead, use M-X Revert File.

14.2. Using Existing Buffers

To get a list of all the buffers that exist, do C-X C-B (List Buffers). Each buffer's name, major mode, and visited filenames are printed. A star at the beginning of a line indicates a buffer which contains changes that have not been saved. The number that appears before a buffer's name in a C-X C-B listing is that buffer's *buffer number*. You can select a buffer by giving its number as a numeric argument to C-X B, which then does not need to read a string from the terminal.

If several buffers have stars, you should save some of them with M-X Save All Files. This finds all the buffers that need saving and asks about each one individually. Saving the buffers this way is much easier and more efficient than selecting each one and typing C-X C-S.

A quick way of glancing at another buffer, faster than selecting it, is to use M-X View Buffer↓<buffername><cr>. This displays the contents of the other buffer and lets you move forward and back a screen at a time with Space and Backspace. See section 15 [Display], page 71.

M-X Rename Buffer↓<new name><cr> changes the name of the currently selected buffer. If <new name> is the null string, the first filename of the visited file is used as the new name of the buffer.

The commands C-X A (^R Append to Buffer) and M-X Insert Buffer can be used to copy text from one buffer to another. See section 9.3 [Copying], page 41.

14.3. Killing Buffers

After you use an EMACS for a while, it may fill up with buffers which you no longer need. Eventually you can reach a point where trying to create any more results in an "URK" error. So whenever it is convenient you should do M-X Kill Some Buffers, which asks about each buffer individually. You can say Y or N to kill it or not. Or you can say Control-R to take a look at it first. This does not actually select the buffer, as the mode line shows, but gives you a recursive editing level in which you can move around and look at things. When you have seen enough to make up your mind, exit the recursive editing level with a C-M-Z and you will be asked the question again. If you say to kill a buffer that needs saving, you will be asked whether it should be saved.

You can kill the buffer FOO by doing C-X K FOO<cr>. You can kill the selected buffer, a common thing to do if you use C-X C-F, by doing C-X K<cr>. If you kill the selected buffer, in any way, EMACS asks you which buffer to select instead. Saying just <cr> at that point tells EMACS to choose one reasonably. C-X K runs the function Kill Buffer.

Chapter Fifteen

Controlling the Display

Since only part of a large file fits on the screen, EMACS tries to show the part that is likely to be interesting. The display control commands allow you to ask to see a different part of the file.

C-L	Clear and redisplay screen, putting point at a specified vertical position.
C-V	Scroll forwards (a screen or a few lines).
M-V	Scroll backwards.
M-R	Move point to the text at a given vertical position.
C-M-R	Shift the function point is in onto the screen.

The terminal screen is rarely large enough to display all of your file. If the whole buffer doesn't fit on the screen, EMACS shows a contiguous portion of it, containing point. It continues to show approximately the same portion until point moves outside of it; then EMACS chooses a new portion centered around the new point. This is EMACS's guess as to what you are most interested in seeing. But if the guess is wrong, you can use the display control commands to see a different portion. The finite area of screen through which you can see part of the buffer is called *the window*, and the choice of where in the buffer to start displaying is also called *the window*.

The basic display control command is C-L (^R New Window). In its simplest form, with no argument, it clears the screen and tells EMACS to display a portion of the buffer centered around where point is currently located (actually, point is placed 35% of the way down from the top; this percentage is controlled by the flag FS % CENTER♦, whose value is the percent of the screen down from the top. See section 22.5 [FS Flags], page 113.).

C-L with a positive argument chooses a new window so as to put point that many lines from the top. An argument of zero puts point on the very top line. Point does not move with respect to the text; rather, the text and point move rigidly on the screen. C-L with a negative argument puts point that many lines from the bottom of the window. For example, C-U -1 C-L puts point on the bottom line, and C-U -5 C-L puts it five lines from the bottom. C-L with an argument does not clear the screen, so that it can move the text on the screen without sending it again if the terminal allows that.

C-U C-L is different from C-L with any other sort of argument. It causes just the line containing point to be redisplayed.

The *scrolling* commands C-V and M-V let you move the whole display up or down a few lines. C-V (^R Next Screen) with an argument shows you that many more lines at

the bottom of the screen, moving the text and point up together as C-L might. C-V with a negative argument shows you more lines at the top of the screen, as does Meta-V (^R Previous Screen) with a positive argument.

To read the buffer a screenful at a time, use the C-V command with no argument. It takes the last two lines at the bottom of the screen and puts them at the top, followed by nearly a whole screenful of lines not visible before. Point is put at the top of the screen. Thus, each C-V shows the "next screenful", except for two lines of overlap to provide continuity. The variable Next Screen Context Lines, if defined, controls how many lines from the bottom of the screen move to the top; the default if the variable is not defined is 2. To move backward, use M-V without an argument, which moves a whole screenful backwards (again with overlap).

Scanning by screenfuls through the buffer for some distance is most conveniently done with the M-X View Buffer command. This command enters a simple subsystem in which Space moves a screenful forward and Backspace moves a screenful backward. The Return character exits, leaving point centered in whatever part of the buffer was visible. Any other character exits and returns point to its former location, and is then executed as a command (unless it is a Rubout; Rubout exits but is not executed). View Buffer can be used to view another buffer by giving the buffer's name as a string argument. In this case, exiting with Return moves point permanently in the other buffer, but does not select it. See section 14 [Buffers], page 67.

You can also scan by screenfuls through a file which you have not visited with the M-X View File command. See section 13.7 [Advanced File Commands], page 64.

To scroll the buffer so that the current function or paragraph is positioned conveniently on the screen, use the C-M-R command (^R Reposition Window). This command tries to get as much as possible of the current function or paragraph onto the screen, preferring the beginning to the end, but not moving point off the screen. A "function" in Lisp mode is a defun; otherwise it is defined to be a set of consecutive unindented lines, or a set of consecutive indented lines.

C-L in all its forms changes the position of point on the screen, carrying the text with it. Another command moves point the same way but leaves the text fixed. It is called Meta-R (^R Move to Screen Edge). With no argument, it puts point at the center of the screen. An argument is used to specify the line to put it on, counting from the top if the argument is positive, or from the bottom if it is negative. Thus, Meta-R with an argument of 0 puts the cursor on the top line of the screen. Meta-R never causes any text to move on the screen; it causes point to move with respect to the screen and the text.

Chapter Sixteen

Two Window Mode

EMACS allows you to split the screen into two *windows* and use them to display parts of two files, or two parts of the same file.

C-X 2	Start showing two windows.
C-X 3	Show two windows but stay "in" the top one.
C-X 1	Show only one window again.
C-X O	Switch to the Other window
C-X 4	Find buffer, file or tag in other window.
C-X ^	Make this window bigger.
C-M-V	Scroll the other window.

The command C-X 2 (^R Two Windows) enters two-window mode. A line of dashes appears across the middle of the screen, dividing the text display area into two halves. Window one, containing the same text as previously occupied the whole screen, fills the top half, while window two fills the bottom half. The cursor moves to window two. If this is your first entry to two-window mode, window two will contain a new buffer named W2. Otherwise, it will contain the same text it held the last time you looked at it. The mode line will now describe the buffer and file in window two. In two window mode, the mode line always applies to the window you are in.

You can now edit in window two as you wish, while window one remains visible. When you are finished editing or looking at the text in window two, C-X 1 (^R One Window) returns to one-window mode. Window one expands to fill the whole screen, and window two disappears until the next C-X 2.

While you are in two window mode you can use C-X O (^R Other Window) to switch between the windows. After doing C-X 2, the cursor is in window two. Doing C-X O moves the cursor back to window one, to exactly where it was before the C-X 2. The difference between this and doing C-X 1 is that C-X O leaves window two visible on the screen. A second C-X O moves the cursor back into window two, to where it was before the first C-X O. And so on...

Often you will be editing one window while using the other just for reference. Then, the command C-M-V (^R Scroll Other Window) is very useful. It scrolls the other window without switching to it and switching back. It scrolls the same way C-V does: with no argument, a whole screen up; with an argument, that many lines up (or down, for a negative argument). With just a minus sign (no digits) as an argument, C-M-V scrolls a whole screenful backwards (what M-V does).

When you are finished using two windows, the C-X 1 command makes window two

vanish. It doesn't matter which window the cursor is in when you do the C-X 1; either way window two vanishes and window one remains. To make window one vanish and window two remain, give C-X 1 an argument.

The C-X 3 (^R View Two Windows) command is like C-X 2 but leaves the cursor in window one. That is, it makes window two appear at the bottom of the screen but leaves the cursor where it was. C-X 2 is equivalent to C-X 3 C-X O. C-X 3 is equivalent to C-X 2 C-X O, but C-X 3 is much faster.

M-X Compare Windows compares the text in the two windows. See section 22.2 [Libraries], page 108. Starting from the pointer in each window, it moves both pointers to the first mismatch. The variable Collapse in Comparison, if it exists, should be a string containing all the "insignificant" characters; any string of insignificant characters matches any other string of those characters. If the variable does not exist, the insignificant characters are return, linefeed, space and tab.

If you quit in the middle of Compare Windows, point is advanced in both windows as far as the matching has proceded. As a result, calling Compare Windows again resumes the comparison.

Normally, the screen is divided evenly between the two windows. You can also redistribute the lines between the windows with the C-X ^ (^R Grow Window) command. It makes the currently selected window get one line bigger, or as many lines as is specified. With a negative argument, it makes the selected window smaller. The allocation of space to the windows is always remembered and changes only when you give a C-X ^ command.

After leaving two-window mode, you can still use C-X O, but the effect is slightly different. Window two does not appear, but whatever was being shown in it appears, in window one (the whole screen). Whatever buffer used to be in window one is stuck, invisibly, into window two. Another C-X O reverses the effect of the first. For example, if window one shows buffer B and window two shows buffer W2 (the usual case), and only window one is visible, then after a C-X O window one shows buffer W2 and window two shows buffer B.

16.1. Multiple Windows and Multiple Buffers

You can view one buffer in both windows. Give C-X 2 an argument as in C-U C-X 2 to go into window two viewing the same buffer as window one. Although the same buffer appears in both windows, they have different values of point, so you can move around in window two while window one continues to show the same text. Then, having found in window two the place you wish to refer to, you can go back to window one with C-X O to make your changes. Finally you can do C-X 1 to make window two leave the screen. If you are already in two window mode, C-U C-X O switches windows carrying the buffer from the old window to the new one so that both are viewing the same buffer.

Buffers can be selected independently in each window. The C-X B command selects a new buffer in whichever window the cursor is in. The other window's buffer does not change. When you do C-X 2 and window two appears it shows whatever buffer used to be visible in it when it was on the screen last.

If you have the same buffer in both windows, you must beware of trying to visit a different file in one of the windows with C-X C-V, because if you bring a new file into this buffer, it will replace the old file in *both* windows. To view different files in the two windows again, you must switch buffers in one of the windows first (with C-X B or C-X C-F, perhaps).

A convenient "combination" command for viewing something in the other window is C-X 4 (^R Visit in Other Window). With this command you can ask to see any specified buffer, file or tag in the other window. Follow the C-X 4 with either B and a buffer name, F or C-F and a file name, or T or "." and a tag name (See section 21 [TAGS], page 99.). This switches to the other window and finds there what you specified. If you were previously in one-window mode, two-window mode is entered. C-X 4 B is similar to to C-X 2 C-X B. C-X 4 F is similar to C-X 2 C-X C-F. C-X 4 T is similar to C-X 2 M-Period. The difference is one of efficiency, and also that C-X 4 works equally well if you are already using two windows.

Chapter Seventeen

Narrowing

Narrowing means focusing in on some portion of the buffer, making the rest temporarily invisible and inaccessible.

C-X N	Narrow down to between point and mark.
C-X W	Widen to view the entire buffer.
C-X P	Narrow down to the page point is in.

When you have narrowed down to a part of the buffer, that part appears to be all there is. You can't see the rest, you can't move into it (motion commands won't go outside the visible part), you can't change it in any way. However, it is not gone, and if you save the file all the invisible text will be saved. In addition to sometimes making it easier to concentrate on a single subroutine or paragraph by eliminating clutter, narrowing can be used to restrict the range of operation of a replace command.

The primary narrowing command is C-X N (^R Set Bounds Region). It sets the *virtual buffer boundaries* at point and the mark, so that only what was between them remains visible. Point moves to the top of the now-visible range, and the mark is left at the end, so that the region marked is unchanged.

The way to undo narrowing is to widen with C-X W (^R Set Bounds Full). This makes all text in the buffer accessible again.

Another way to narrow is to narrow to just one page, with C-X P (^R Set Bounds Page). See section 18 [Pages], page 79.

You can get information on what part of the buffer you are narrowed down to using the C-X = command. See section 11.4 [Filling], page 50.

Note that the virtual buffer boundaries are a powerful TECO mechanism used internally in EMACS in many ways. While only the commands described here set them so as you can see, many others set them temporarily using the TECO commands FS VB♦ and FS VZ♦, and restore them before finishing.

Chapter Eighteen

Commands for Manipulating Pages

Files are often thought of as divided into *pages* by the ASCII character formfeed (^L). For example, if a file is printed on a line printer, each page of the file, in this sense, will start on a new page of paper. EMACS has commands for moving over and operating on pages.

C-M-L	Insert formfeed.
C-X C-P	Put point and mark around this page (or another page).
C-X [	Move point to previous page boundary.
C-X]	Move point to next page boundary.
C-X P	Narrow down to just this (or next) page.
C-X L	Count the lines in this page.
M-X What Page	Print current page and line number.

Most editors make the division of a file into pages extremely important. For example, they may be unable to show more than one page of the file at any time. EMACS treats a formfeed character just like any other character. It can be inserted with C-Q C-L (or, C-M-L), and deleted with Rubout. Thus, you are free to paginate your file, or not. However, since pages are often meaningful divisions of the file, commands are provided to move over them and operate on them. If you happen to like seeing only one page of the file at a time, you can use the PAGE library. See section 18.1 [PAGE], page 80.

The C-X [(^R Previous Page) command moves point to the previous page delimiter (actually, to right after it). If point starts out right after a page delimiter, it skips that one and stops at the previous one. A numeric argument serves as a repeat count. The C-X] (^R Next Page) command moves forward past the next page delimiter.

The command M-X What Page prints the page and line number of the cursor in the echo area. There is a separate command to print this information because it is likely to be slow and should not slow down anything else (The design of TECO is such that it is not possible to know the absolute number of the page you are in, except by scanning through the whole file counting pages).

The C-X C-P command (^R Mark Page) puts point at the beginning of the current page and the mark at the end. The page terminator at the end is included (the mark follows it). That at the front is excluded (point follows it). This command can be followed by a C-W to kill a page which is to be moved elsewhere.

A numeric argument to C-X C-P is used to specify which page to go to, relative to

the current one. Zero means the current page. One means the next page, and -1 means the previous one.

The command C-X P (^R Set Bounds Page) narrows down to just one page. Everything before and after becomes temporarily invisible and inaccessible (See section 17 [Narrowing], page 77.). Use C-X W to undo this. Both page terminators, the preceding one and the following one, are excluded from the visible region. Like C-X C-P, the C-X P command normally selects the current page, but allows you to specify which page explicitly relative to the current one with a numeric argument. However, when you are already narrowed down to one page, C-X P moves you to the next page (otherwise, it would be a useless no-op). One effect of this quirk is that several C-X P's in a row get first the current page and then successive pages.

Just what delimits pages is controlled by the variable Page Delimiter, which should contain a TECO search string (See section 19.3 [TECO search strings], page 85.) which will match a page separator. Normally, it is a string containing just ↑L. For an INFO file, it might usefully be changed to ↑_↑L↑O↑_, which means that either a ↑_↑L or just a ↑_ (whatever separates INFO nodes) should be a page separator. In any case, page separators are recognized as such only at the beginning of a line. The paragraph commands consider each page boundary a paragraph boundary as well.

The C-X L command (^R Count Lines Page) is good for deciding where to break a page in two. It first prints (in the echo area) the total number of lines in the current page, and then divides it up into those preceding the current line and those following, as in

```
Page has 96 lines (72+25)
```

Notice that the sum is off by one; this is correct if point is not at the front of a line.

18.1. Editing Only One Page at a Time

The PAGE library is meant to allow the handling of pages as discrete, often independent units, letting you see only one page at a time, and providing commands to move between pages, split pages and join pages. It contrives to show the number of the page you are looking at in the mode line. You can also ask to see a *directory* of the pages in the file, or to insert it into the file. This is an extension of and replacement for the facility provided by the C-X P command in standard EMACS. It is an optional library because we do not think it is necessarily an improvement.

The commands in the PAGE library supplant and redefine commands in standard EMACS. Therefore, you cannot use them unless you give the command M-X Load Library↓PAGE<cr> explicitly. See section 22.2 [Libraries], page 108.

C-X]	Move to next page.
C-X [	Move to previous page.
C-X C-P	Move to page by absolute number.
C-X P	Split this page at point.
C-X J	Join this page to the next or previous one.
C-X W	See the whole file again.

The most fundamental thing to do with PAGE is to go to a specific page. This can be done by giving the page number as an argument to C-X C-P (^R Goto Page). If you give a number too big, the last page in the file is selected.

For convenience, C-X C-P with no argument when you are looking at the whole file selects the page containing point. When you are looking at only one page, C-X C-P with no argument goes to the next page and with a negative argument goes to the previous page.

However, the main commands for moving forward or backward by pages are C-X [and C-X] (^R Goto Previous Page and ^R Goto Next Page). These take a numeric argument (either sign) and move that many pages.

When you want to go back to viewing the whole file instead of just one page, you can use the C-X W (^R Widen Bounds) command. These are the same characters that you would use in standard EMACS, but they run a different function that knows to remove the page number from the mode line.

The C-S (^R Incremental Search) and C-R (^R Reverse Search) are redefined to widen bounds first and narrow them again afterwards. So you can search through the whole file, but afterward see only the page in which the search ended. In fact, PAGE goes through some trouble to work with whatever search functions you prefer to use, and find them wherever you put them.

To split an existing page, you could insert a ↑L, but unless you do this while seeing the whole file, PAGE might get confused for a while. A way that is less tricky is to use C-X P (^R Insert Pagemark) which inserts the page mark, and narrows down to the second of the two pages formed from the old page. To get rid of a page mark without worry, use C-X J (^R Join Next Page). It gets rid of the page mark after the current page; or, with a negative argument, gets rid of the page mark before this page.

A page mark is defined as <CRLF>↑L. If you set the variable PAGE Flush CRLF to 1, a page mark is <CRLF>↑L<CRLF>, which has the effect of making the CRLF at the beginning of each page invisible. This may be desirable for EMACS library source files. You can also specify some other string in place of ↑L by setting the variable Page Delimiter. If Page Delimiter specifies multiple alternatives, the first alternative is the one PAGE will insert, but all will be recognized.

To see a list of all the pages in the file, each one represented by its first nonempty line, use M-X View Page Directory. It prints out the first non-blank line on each page, preceded by its page number. M-X Insert Page Directory inserts the same directory into the buffer at point. If you give it an argument, it tries to make the whole thing into a comment by putting the Comment Start string at the front of each line and the Comment End string at the end.

If the variable Page Setup Hook exists, PAGE will execute its value as the function for placing PAGE's functions on keys.

Chapter Nineteen

Replacement Commands

Global search-and-replace operations are not used as often in EMACS as they are in other editors, but they are still provided. In addition to the simple Replace operation which is like that found in most editors, there is a Query Replace operation which asks you, for each occurrence of the pattern, whether to replace it.

19.1. Query Replace

To replace every instance of FOO with BAR, you can do

```
M-X Replace◊FOO◊BAR<cr>
```

Replacement is done only after point, so if you want to cover the whole buffer you must go to the beginning first. Replacement continues to the end of the buffer, but you can restrict it by narrowing. See section 17 [Narrowing], page 77.

Unless the variable Case Replace is zero, an attempt is made to preserve case; give both FOO and BAR in lower case, and if a particular FOO is found with a capital initial or all capitalized, the BAR which replaces it will be likewise.

If you give Replace (or Query Replace) an argument, then it insists that the occurrences of FOO be delimited by break characters (or an end of the buffer). So you can find only the word FOO, and not FOO when it is part of FOOBAR.

The string FOO to be replaced is actually a TECO search string, a type of pattern, in which the characters ↑B, ↑N, ↑O, ↑Q, ↑X, and ↑] are special. See section 19.3 [TECO search strings], page 85.

If you are afraid that there may be some FOO's that should not be changed, EMACS can still help you. Use M-X Query Replace◊FOO◊BAR<cr>. This displays each FOO and waits for you to say whether to replace it with a BAR. The things you can type when you are shown a FOO are:

Space	to replace the FOO (preserving case, just like plain Replace, unless Case Replace is zero).
Rubout	to skip to the next FOO without replacing this one.
Comma	to replace this FOO and display the result. You are then asked for another input character, except that since the replacement has already been made, Rubout and Space are equivalent.
Altmode	to exit without doing any more replacements.

Period	to replace this FOO and then exit.
!	to replace all remaining FOO's without asking (Replace actually works by calling Query Replace and pretending that a ! was typed in).
^	to go back to the previous FOO (or, where it was), in case you have made a mistake. This works by jumping to the mark (Query Replace sets the mark each time it finds a FOO).
C-R	to enter a recursive editing level, in case the FOO needs to be edited rather than just replaced with a BAR. When you are done, exit the recursive editing level with C-M-Z.
C-W	to delete the FOO, and then start editing the buffer. When you are finished editing whatever is to replace the FOO, exit the recursive editing level with C-M-Z.

If you type any other character, the Query Replace is exited, and the character executed as a command. To restart the Query Replace, use C-X Altmode which is a command to re-execute the previous minibuffer command or extended command. See section 5 [M-X], page 19.

19.1.1. Running Query Replace with the Minibuffer

Meta-% gives you a minibuffer pre-initialized with "MM Query Replace♦". This is the easiest way to invoke Query Replace. It also allows you to get Returns and Altmodes into the arguments.

With the minibuffer, Query Replace can be given a precomma argument, which says that the second string argument is actually a TECO program to be executed to perform the replacement, rather than simply a string to replace with.

When you invoke Query Replace from the minibuffer, the character C-] becomes special (because it is special in TECO programs). In order to get a C-] into the search string or the replacement string, you must use two of them. You can also use a C-] to quote an Altmode. In the minibuffer, Return has no syntactic significance, so there is no need for a way to quote it. However, in order to insert any control characters into the arguments, you need to quote them again with C-Q. So, to get C-Q C-X into the search string so as to search for a C-X, you have to type C-Q C-Q C-Q C-X.

19.2. Other Search-and-loop Functions

Here are some other functions related to replacement. Their arguments are TECO search strings (See section 19.3 [TECO search strings], page 85.). They all operate from point to the end of the buffer (or where narrowing stops them).

M-X Occur♦FOO<cr>
: which finds all occurrences of FOO after point. It prints each line containing one. With an argument, it prints that many lines before and after each occurrence.

M-X How Many♦FOO<cr>
: types the number of occurrences of FOO after point.

M-X Keep Lines↓FOO<cr>
kills all lines after point that don't contain FOO.
M-X Flush Lines↓FOO<cr>
kills all lines after point that contain FOO.

19.3. TECO Search Strings

The first string argument to Replace and Query Replace is actually a TECO search string. This means that the characters C-X, C-B, C-N, C-O, and C-Q have special meanings. C-X matches any character. C-B matches any "delimiter" character (anything which the word commands consider not part of a word, according to the syntax table. See section 22.4 [Syntax], page 111.). C-N negates what follows, so that C-N A matches anything but A, and C-N C-B matches any non-delimiter. C-O means "or", so that XYXY C-O ZZZ matches *either* XYXY or ZZZ. C-O can be used more than once in a pattern. C-Q quotes the following character, in case you want to search for one of the special control characters. However, you can't quote an Altmode or a Return in this way because its specialness is at an earlier stage of processing.

Some variables are supposed to have TECO search strings as their values. For example, Page Delimiter is supposed to be a search string to match anything which should start a page. This is so that you can use C-O to match several alternatives. In the values of such variables, C-B, C-N, C-O, C-Q, C-X and C-] are special, but Altmode is not. C-B through C-X are quoted with a C-Q, and C-] is quoted with another C-].

The function Apropos and all similar functions actually take TECO search strings as arguments, so you can search for more than one substring at a time. This is useful because doing Apropos on word↑Opara is not really slower than searching for just "word" or just "para".

Chapter Twenty

Editing Programs

Special features for editing programs include automatic indentation, comment alignment, parenthesis matching, and the ability to move over and kill balanced expressions. Many of these features are parameterized so that they can work for any programming language.

For each language there is a special *major mode* which customizes EMACS slightly to be better suited to editing programs written in that language. These modes sometimes offer special facilities as well.

See section 11.1 [Words], page 45. Moving over words is useful for editing programs as well as text.

See section 11.2 [Paragraphs], page 47. Most programming language major modes define paragraphs to be separated only by blank lines and page boundaries. This makes the paragraph commands useful for editing programs.

See section 21 [Tags], page 99. The TAGS package can remember all the labels or functions in a multi-file program and find any one of them quickly.

20.1. Major Modes

When EMACS starts up, it is in what is called *Fundamental mode*, which means that the single and double character commands are defined so as to be convenient in general. More precisely, in Fundamental mode every EMACS option is set in its default state. For editing any specific type of text, such as Lisp code or English text, you can tell EMACS to change the meanings of a few commands to become more specifically adapted to the task. This is done by switching from Fundamental mode to one of the other major modes. Most commands remain unchanged; the ones which usually change are Tab, Rubout, and Linefeed. In addition, the commands which handle comments use the mode to determine how comments are to be delimited.

Selecting a new major mode is done with an M-X command. Each major mode is the name of the function to select that mode. Thus, you can enter Lisp mode by executing M-X Lisp (short for M-X Lisp Mode). The major modes are mutually exclusive; you can be in only one major mode at a time. When at top level, EMACS always says in the mode line which major mode you are in. Often EMACS enters the correct major mode for a file simply based on the file's extension, and you do not have to worry about selecting a mode.

You can specify which major mode should be used for editing a certain file by putting -*-<mode name>-*- somewhere in the first nonblank line of the file. For example, this file has -*-Text-*-.

Many major modes redefine the syntactical properties of characters appearing in the buffer. See section 22.4 [Syntax], page 111.

Most programming language major modes specify that only blank lines separate paragraphs. This is so that the paragraph commands do not become useless. They also cause Auto Fill mode to use the definition of Tab to indent the new lines it creates. This is because most lines are usually indented.

Major modes are standardly defined for the languages Lisp, Muddle, MIDAS, FAIL, MACRO-10, Macsyma, BCPL, BLISS, PASCAL, FORTRAN, SAIL, TECO, and PL1.

There is also Text mode, designed for editing English text, or input to text justifier programs. See section 11 [Text], page 45.

20.2. Indentation Commands for Code

Tab	Indents current line.
Linefeed	Equivalent to Return followed by Tab.
M-^	Joins two lines, leaving one space between if appropriate.
M-\	Deletes all spaces and tabs around point.
M-M	Moves to the first nonblank character on the line.

Most programming languages have some indentation convention. For Lisp code, lines are indented according to their nesting in parentheses. For assembler code, almost all lines start with a single tab, but some have one or more spaces as well. Indenting TECO code is an art rather than a science, but it is often useful to indent a line under the previous one.

The way to request indentation is with the Tab command. Each major mode defines this command to perform the sort of indentation appropriate for the particular language. In Lisp mode, Tab aligns the line according to its depth in parentheses. No matter where in the line you are when you type Tab, it aligns the line as a whole. In MIDAS mode, Tab inserts a tab, that being the standard indentation for assembly code. In TECO mode, Tab realigns the current line to match a previous line. PL1 mode (See the file INFO:EPL1.INFO.) knows in great detail about the keywords of the language so as to indent lines according to the nesting structure.

The command Linefeed (^R Indent New Line) does a Return and then does a Tab on the next line. Thus, Linefeed at the end of the line makes a following blank line and supplies it with the usual amount of indentation, just as Return would make an empty line. Linefeed in the middle of a line breaks the line and supplies the usual indentation in front of the new line.

The inverse of Linefeed is Meta-^ or C-M-^ (^R Delete Indentation). This command deletes the indentation at the front of the current line, and the line boundary as well. They are replaced by a single space, or by no space if before a ")" or after a "(", or at the beginning of a line. To delete just the indentation of a line, go to the beginning of

the line and use Meta-\ (^R Delete Horizontal Space), which deletes all spaces and tabs around the cursor.

To insert an indented line before the current one, do C-A, C-O, and then Tab. To make an indented line after the current one, use C-E Linefeed.

To move over the indentation on a line, do Meta-M or C-M-M (^R Back to Indentation). These commands, given anywhere on a line, position the cursor at the first nonblank character on the line.

20.3. Automatic Display Of Matching Parentheses

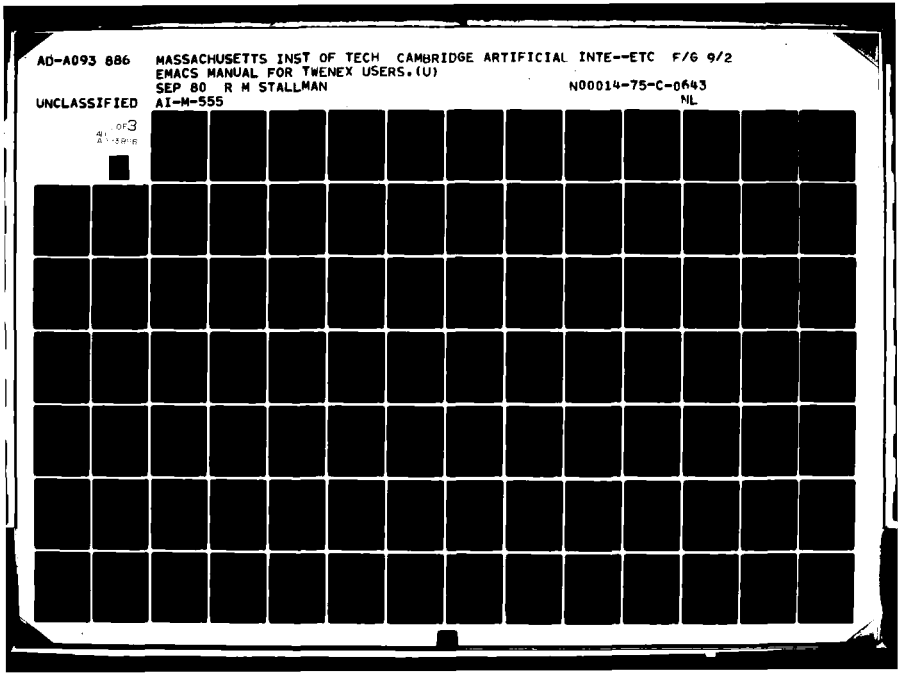
The purpose of the EMACS parenthesis-matching feature is to show automatically how parentheses balance in text being typed in. When this feature is enabled, after a close parenthesis or other close bracket character is inserted the cursor automatically moves for an instant to the open which balances the newly inserted character. The cursor stays at the open parenthesis for a second before returning home, if you don't type any more commands during that time. If you type more commands before the second is up, EMACS won't wait the whole second.

It is worth emphasizing that the location of point, the place where your type-in will be inserted, is not affected by the parenthesis matching feature. It stays after the close parenthesis, where it would normally be. Only the cursor on the screen moves away and back. You can type ahead freely as if the matching feature were not there. In fact, if you type fast enough, you won't see the cursor move. You must pause after typing a close parenthesis to see the open parenthesis.

The variable Display Matching Paren controls parenthesis display. If it is zero, the feature is disabled. If the variable is nonzero, then its absolute value is the number of seconds for the cursor to stay at the open parenthesis before coming back to its real location. The sign of the variable is also significant: if it is negative, then the open parenthesis is shown only if it is already on the screen. If the variable is positive, then EMACS will actually recenter the window to show the text around the open parenthesis. The default setting of the variable is -1.

An additional parameter is whether EMACS should warn you by ringing the bell if you type an unmatched close parenthesis. The default is to warn you if you are editing a language in which parentheses are essential, like Lisp, but not to do so for languages in which parentheses are not so crucial. This is controlled by the variable Permit Unmatched Paren. When it is 1, you are never warned (they are always "permitted"). When it is -1, you are warned only in Lisp mode and similar modes (this is the default). Note that these modes operate by locally setting the variable to 1 if it was -1. When it is 0, you are warned regardless of the major mode. Unmatched parens are *always* "permitted" in that EMACS will never refuse to insert them.

While this feature was intended primarily for Lisp, it can be used just as well for any other language, and it is not dependent on what major mode you are in. It is expected that you wouldn't want it in Text mode, so Text mode sets the variable Display Matching Paren locally to zero. If you do want the feature in Text mode, you can create a Text Mode Hook variable which sets the variable back to -1. See the file


AD-A093 886
MASSACHUSETTS INST OF TECH CAMBRIDGE ARTIFICIAL INTE--ETC F/G 9/2
EMACS MANUAL FOR TWENEX USERS.(U)
SEP 80 R M STALLMAN
N00014-75-C-0643
UNCLASSIFIED
AI-W-555
NL
OF 3

INFO:CONV.INFO. node Hooks, for more info on Text Mode Hook. The way to control which characters trigger this feature is with the syntax table. Any character whose Lisp syntax is ")" will cause the matching character with syntax "(" to be shown. Most major modes automatically set up the syntax table (See section 22.4 [Syntax], page 111.).

The syntax table also controls what is done with the case of "mismatched" parens, as in "[ )". The third slot in a close parenthesis character's syntax table entry should be the proper matching open parenthesis character, if you want this feature turned on. If that slot contains a space instead, then any open parenthesis character is considered a legitimate match. If a close parenthesis is mismatched, it is inserted as always, but it rings the bell.

The implementation of this feature uses the TECO flag FS ^R PAREN♦. See section 22.5 [FS Flags], page 113.

20.4. Manipulating Comments

The comment commands insert, kill and align comments. There are also commands for moving through existing code and inserting comments.

C-;	Insert or align comment.
M-;	The same.
C-M-;	Kill comment.
Return	Move past comment terminator and onto new line.
C-X ;	Set comment column.
M-N	Move to Next line and insert comment.
M-P	Move to Previous line and insert comment.
M-J	Continue a comment on a new line.
M-Linefeed	The same.

The command that creates a comment is Control-; or Meta-; (^R Indent for Comment). It moves to the end of the line, indents to the comment column, and inserts whatever string EMACS believes comments are supposed to start with (normally ";"). If the line goes past the comment column, then the indentation is done to a suitable boundary (usually, a multiple of 8).

Control-; can also be used to align an existing comment. If a line already contains the string that starts comments, then C-; just moves point after it and indents it to the right place (where a comment would have been created if there had been none).

Even when an existing comment is properly aligned, C-; is still useful for moving directly to the start of the comment.

Some languages require an explicit comment terminator, which is not simply the end of the line. Although the language may then allow comments in the middle of the line, the EMACS comment commands assume that a comment is the last thing on the line. When there is a comment terminator, C-; inserts the terminator as well as the starter, and leaves point between them, so that you are ready to insert the text of the comment. When you are done, the Return command given immediately before the comment terminator acts as if it were at the end of the line already: it moves down to

or creates a following blank line. It does not break the existing line before the comment terminator as you would expect.

C-M-; (^R Kill Comment) kills the comment on the current line, if there is one. The indentation before the start of the comment is killed as well. If there does not appear to be a comment in the line, nothing is done. Since killed text can be reinserted with C-Y, this command is useful for moving a comment from one line to another.

20.4.1. Multiple Lines of Comments

If you wish to align a large number of comments, you can give Control-; an argument and it indents what comments exist on that many lines, creating none. Point is left after the last line processed (unlike the no-argument case).

When adding comments to a long stretch of existing code, the commands M-N (^R Down Comment Line) and M-P (^R Up Comment Line) may be useful. They are like C-N and C-P except that they do a C-; automatically on each line as you move to it, and delete any empty comment from the line as you leave it. Thus, you can use M-N to move down through the code, putting text into the comments when you want to, and allowing the comments that you don't fill in to be removed because they remained empty.

If you are typing a comment and find that you wish to continue it on another line, you can use the command Meta-J or Meta-Linefeed (^R Indent New Comment Line), which terminates the comment you are typing, creates or gobbles a new blank line, and begins a new comment indented under the old one. When Auto Fill mode is on, going past the fill column while typing a comment causes the comment to be continued in just this fashion. Note that if the next line is not blank, a blank line is created, instead of putting the next line of the comment on the next line of code. To do that, use M-N.

20.4.2. Double and Triple Semicolons in Lisp

In Lisp code there are conventions for comments which start with more than one semicolon. Comments which start with two semicolons are indented as if they were lines of code, instead of at the comment column. Comments which start with three semicolons are supposed to start at the left margin. EMACS understands these conventions by indenting a double-semicolon comment using Tab, and by not changing the indentation of a triple-semicolon comment at all. (Actually, this rule applies whenever the comment starter is a single character and is duplicated). Note that the ATSIGN program considers a four-semicolon comment a subtitle in Lisp code.

20.4.3. Options Controlling Comments

The comment column is stored in the variable Comment Column. You can set it to a number explicitly. Alternatively, the command C-X ; (^R Set Comment Column) sets the comment column to the column point is at. C-U C-X ; sets the comment column to match the last comment before point in the buffer, and then does a Meta-; to align the current line's comment under the previous one.

Many major modes supply default local values for the comment column. In addition, C-X ; automatically makes the variable Comment Column local. Otherwise, if you change the variable itself, it changes globally (for all buffers) unless it has been made local in the selected one. See section 22.7 [Locals], page 118.

The string recognized as the start of a comment is stored in the variable Comment Start, while the string used to start a new comment is kept in Comment Begin (if that is zero, Comment Start is used for new comments). This makes it possible for you to have any ";" recognized as starting a comment but have new comments begin with ";; ** ".

The string used to end a comment is kept in the variable Comment End. In many languages no comment end is needed as the comment extends to the end of the line. Then, this variable is a null string.

If Comment Multi Line is nonzero, then Meta-Linefeed within a comment does not close the old comment and start a new comment on the new line. Instead it allows the original comment to extend through the new line. This is legitimate if the language has explicit comment terminators. Then it's a matter of taste.

20.5. Lisp Mode and Muddle Mode

Lisp's simple syntax makes it much easier for an editor to understand; as a result, EMACS can do more for Lisp, and with less work, than for any other language.

Lisp programs should be edited in Lisp mode. In this mode, Tab is defined to indent the current line according to the conventions of Lisp programming style. It does not matter where in the line Tab is used; the effect on the line is the same. The function which does the work is called ^R Indent for Lisp. Linefeed, as usual, does a Return and a Tab, so it moves to the next line and indents it.

As in most modes where indentation is likely to vary from line to line, Rubout is redefined to treat a tab as if it were the equivalent number of space (^R Backward Delete Hacking Tabs). This makes it possible to rub out indentation one position at a time without worrying whether it is made up of spaces or tabs. Control-Rubout does the ordinary type of rubbing out which rubs out a whole tab at once.

Paragraphs are defined to start only with blank lines so that the paragraph commands can be useful. Auto Fill indents the new lines which it creates. Comments start with ";". If Atom Word mode is in effect, them in Lisp mode the word-motion commands regard each Lisp atom as one word.

Lisp mode is exactly right only for the MacLisp dialect of Lisp. For Interlisp, there is Interlisp mode, which is only slightly different. Mainly, it has a different syntax table which enables all the Lisp commands to work as documented on Interlisp code. The only noteworthy difference is that comments begin with "(*" and end with ")".

The LEDIT library allows EMACS and Lisp to communicate, telling Lisp the new definitions of functions which you edit in EMACS. See the file INFO:LEDIT.INFO. For Interlisp, use the INTER library. See the file INFO:INTER.INFO.

The language Muddle is a variant form of Lisp which shares the concept of using

parentheses (of various sorts) as the main syntactical construct. It can be edited using Muddle mode, which is almost the same as Lisp mode and provides the same features, differing only in the syntax table used.

20.5.1. Moving Over and Killing Lists and S-expressions

C-M-F	Move Forward over s-expression.
C-M-B	Move Backward.
C-M-K	Kill s-expression forward.
C-M-Rubout	Kill s-expression backward.
C-M-U	Move Up and backward in list structure.
C-M-(	The same.
C-M-)	Move up and forward in list structure.
C-M-D	Move Down and forward in list structure.
C-M-N	Move forward over a list.
C-M-P	Move backward over a list.
C-M-T	Transpose s-expressions.
C-M-@	Put mark after s-expression.
M-(	Put parentheses around next s-expression(s).
M-)	Move past next close parenthesis and reindent.

By convention, EMACS commands that deal with balanced parentheses are usually Control-Meta- characters. They tend to be analogous in function to their Control- and Meta- equivalents. These commands are usually thought of as pertaining to Lisp, but can be useful with any language in which some sort of parentheses exist (including English).

To move forward over an s-expression, use C-M-F (^R Forward Sexp). If the first significant character after point is an "(", C-M-F moves past the matching ")". If the first character is a ")", C-M-F just moves past it. If the character begins an atom, C-M-F moves to the end of the atom. C-M-F with an argument repeats that operation the specified number of times; with a negative argument, it moves backward instead.

The command C-M-B (^R Backward Sexp) moves backward over an s-expression; it is like C-M-F with the argument negated. If there are "'"-like characters in front of the s-expression moved over, they are moved over as well. Thus, with point after " 'FOO ", C-M-B leaves point before the "'", not before the "F".

These two commands (and most of the commands in this section) do not know how to deal with the presence of comments. Although that would be easy to fix for forward motion, for backward motion the syntax of Lisp makes it nearly impossible. Comments by themselves wouldn't be so bad, but handling comments and "|" both is impossible to do locally. In a line

```
((FOO ; | BAR
```

are the inside a symbol delimited by "|"'s? I do not think it would be advisable to make C-M-F handle comments without making C-M-B handle them as well.

For this reason, two other commands which move over lists instead of s-expressions are often useful. They are C-M-N (^R Forward List) and C-M-P (^R Backward List). They act like C-M-F and C-M-B except that they don't stop on atoms; after moving over an atom, they move over the next expression, stopping after

moving over a list. With this command, you can avoid stopping after all of the words in a comment.

Killing an s-expression at a time can be done with C-M-K and C-M-Rubout (^R Forward Kill Sexp and ^R Backward Kill Sexp). C-M-K kills the characters that C-M-F would move over, and C-M-Rubout kills what C-M-B would move over.

C-M-F and C-M-B stay at the same level in parentheses, when that's possible. To move *up* one (or n) levels, use C-M-(or C-M-) (^R Backward Up List and ^R Forward Up List). C-M-(moves backwards up past one containing "(". C-M-) moves forwards up past one containing ")". Given a positive argument, these commands move up the specified number of levels of parentheses. C-M-U is another name for C-M-(, which is easier to type, especially on non-Meta keyboards. If you use that name, it is useful to know that a negative argument makes the command move up forwards, like C-M-).

To move *down* in list structure, use C-M-D (^R Down List). It is nearly the same as searching for a "(".

A somewhat random-sounding command which is nevertheless easy to use is C-M-T (^R Transpose Sexps), which moves the cursor forward over one s-expression, dragging the previous s-expression along. An argument serves as a repeat count, and a negative argument drags backwards (thus canceling out the effect of C-M-T with a positive argument). An argument of zero, rather than doing nothing, transposes the s-expressions at the point and the mark.

To make the region be the next s-expression in the buffer, use or C-M-@ (^R Mark Sexp) which sets mark at the same place that C-M-F would move to. C-M-@ takes arguments like C-M-F. In particular, a negative argument is useful for putting the mark at the beginning of the previous s-expression.

The commands M-(("^R Insert ()") and M-) ("^R Move Over)") are designed for a style of editing which keeps parentheses balanced at all times. M-(inserts a pair of parentheses, either together as in "()", or, if given an argument, around the next several s-expressions, and leaves point after the open parenthesis. Instead of typing "(FOO)", you can type M-(FOO, which has the same effect except for leaving the cursor before the close parenthesis. Then you type M-), which moves past the close parenthesis, deleting any indentation preceding it (in this example there is none), and indenting with Linefeed after it.

The library LSPUTL contains two other list commands. Find Pat searches for lists which contain several strings. ^R Extract Sublist replaces a list with one of its sublists. See section 22.2 [Libraries], page 108.

<level>M-X Find Pat↓<mainstring>↓<string1>↓<string2> searches for a list which contains <mainstring> at a depth of <level> lists down, and contains <string1> and <string2> at any level. There can be any number of such additional strings to search for; there can be zero.

^R Extract Sublist is meant to be connected to a character. Given an argument of <level>, it replaces the list <level> levels up from point with the list starting after point (that is, with a sublist).

The list commands' understanding of syntax is completely controlled by the syntax table. Any character can, for example, be declared to act like an open parenthesis. See section 22.4 [Syntax], page 111.

20.5.2. Commands for Manipulating Defuns

C-M-[, C-M-A	Move to beginning of defun.
C-M-], C-M-E	Move to end of defun.
C-M-H	Put region around wHole defun.

In EMACS, a list at the top level in the buffer is called a defun, regardless of what function is actually called, because such lists usually call defun. There are EMACS commands to move to the beginning or end of the current defun: C-M-[(^R Beginning of Defun) moves to the beginning, and C-M-] (^R End of Defun) moves to the end. If you wish to operate on the current defun, use C-M-H (^R Mark Defun) which puts point at the beginning and mark at the end of the current or next defun. Alternate names for these two commands are C-M-A for C-M-[and C-M-E for C-M-]. The alternate names are easier to type on many non-Meta keyboards.

20.6. Lisp Grinding

The best way to keep Lisp code properly indented ("ground") is to use EMACS to re-indent it when it is changed. EMACS has commands to indent properly either a single line, a specified number of lines, or all of the lines inside a single s-expression.

Tab	In Lisp mode, reindents line according to parenthesis depth.
Linefeed	Equivalent to Return followed by Tab.
M-^	Join two lines, leaving one space between them if appropriate.
C-M-Q	Reindent all the lines within one list.
C-M-G	Grind a list, moving code between lines.

The basic indentation function is ^R Indent for Lisp, which gives the current line the correct indentation as determined from the previous lines' indentation and parenthesis structure. This function is normally found on C-M-Tab, but when in Lisp mode it is placed on Tab as well (Use Meta-Tab to insert a tab). When given at the beginning of a line, it leaves point after the indentation; when given inside the text on the line, point remains fixed with respect to the characters around it.

When entering a large amount of new code, it becomes useful that Linefeed (^R Indent New Line) is equivalent to a Return followed by a Tab. In Lisp mode, a Linefeed creates or moves down onto a blank line, and then give it the appropriate indentation.

To join two lines together, use the Meta-^ or Control-Meta-^ command (^R Delete Indentation), which is approximately the opposite of Linefeed. It deletes any spaces and tabs at the front of the current line, and then deletes the line separator before the line. A single space is then inserted, if EMACS thinks that one is needed there. Spaces are not needed before a close parenthesis, or after an open parenthesis.

If you are dissatisfied about where Tab wants to place the second and later lines of an s-expression, you can override it. If you alter the indentation of one of the lines yourself, then Tab will indent successive lines of the same list to be underneath it. This is the right thing for functions which Tab indents unaesthetically. Of course, it is

the wrong thing for PROG tags (if you like to un-indent them), but it's impossible to be right for both.

When you wish to re-indent code which has been altered or moved to a different level in the list structure, you have several commands available. You can re-indent a specific number of lines by giving the ordinary indent command (Tab, in Lisp mode) an argument. This indents as many lines as you say and moves to the line following them. Thus, if you underestimate, you can repeat the process later.

You can re-indent the contents of a single s-expression by positioning point before the beginning of it and typing Control-Meta-Q (^R Indent Sexp). The line the s-expression starts on is not re-indented; thus, only the relative indentation with in the s-expression, and not its position, is changed. To correct the position as well, type a Tab before the C-M-Q.

Another way to specify the range to be re-indented is with point and mark. The command C-M-\ (^R Indent Region) applies Tab to every line whose first character is between point and mark. In Lisp mode, this does a Lisp indent.

A more powerful grind command which can move text between lines is C-M-G (^R Format Code). You might or might not like it. It knows in different ways about Lisp code and Macsyma code.

20.7. Editing Assembly-Language Programs

MIDAS mode is designed for editing programs written in MIDAS or other PDP-10 or PDP-11 assemblers. (MACRO mode and FAIL mode also exist but differ only in the syntax table). In MIDAS mode, comments start with ";", and "<" and ">" have the syntax of parentheses. In addition, there are five special commands which understand the syntax of instructions and labels. These commands are:

C-M-N	Go to Next label.
C-M-P	Go to Previous label.
C-M-A	Go to Accumulator field of instruction.
C-M-E	Go to Effective Address field.
C-M-D	Kill next word and its Delimiting character.
M-[	Move up to previous paragraph boundary.
M-]	Move down to next paragraph boundary.

Any line which is not indented and is not just a comment is taken to contain a label. The label is everything up to the first whitespace (or the end of the line). C-M-N (^R Go to Next Label) and C-M-P (^R Go to Previous Label) both position the cursor right at the end of a label; C-M-N moves forward or down and C-M-P moves backward or up. At the beginning of a line containing a label, C-M-N moves past it. Past the label on the same line, C-M-P moves back to the end of it. If you kill a couple of indented lines and want to insert them right after a label, these commands put you at just the right place.

C-M-A (^R Go to AC Field) and C-M-E (^R Go to Address Field) move to the beginning of the accumulator (AC) or effective address fields of a PDP-10 instruction. They always stay on the same line, moving either forward or backward as appropriate.

If the instruction contains no AC field, C-M-A positions to the start of the address field. If the instruction is just an opcode with no AC field or address field, a space is inserted after the opcode and the cursor left after the space. In PDP-11 programs, C-M-A moves to the first operand and C-M-E moves to the second operand.

Once you've gone to the beginning of the AC field you can often use C-M-D (^R Kill Terminated Word) to kill the AC name and the comma which terminates it. You can also use it at the beginning of a line, to kill a label and its colon, or after a line's indentation to kill the opcode and the following space. This is very convenient for moving a label from one line to another. In general, C-M-D is equivalent to M-D C-D, except that all the characters are saved on the kill ring, together. C-D, a "deletion" command, doesn't save on the kill ring if not given an argument.

The M-[and M-] commands are not, strictly speaking, redefined by MIDAS mode, since they always go up or down to a paragraph boundary. However, in MIDAS mode the criterion for a paragraph boundary is changed by setting the variable Paragraph Delimiter (See section 11.2 [Paragraphs], page 47.) so that only blank lines (and pages) delimit paragraphs. So, M-[moves up to the previous blank line and M-] moves to the next one.

20.8. Major Modes for Other Languages

MACSYMA mode redefines the syntax of words and s-expressions in an attempt to make it easier to move over MACSYMA syntactic units. In addition, the C-M-G "grind" command is told to grind text as MACSYMA instead of as Lisp. Also, the syntax of MACSYMA comments is understood.

TECO mode is good for editing EMACS library source files. It connects Tab to ^R Indent Nested (see its self-documentation). Comments start with "!* " and end with "!". In addition, the PURIFY library, which contains many things useful for processing library sources (including the commands to compile them), is loaded. M-' and M-" are connected to functions ^R Forward TECO Conditional and ^R Backward TECO Conditional which move forward and backward over balanced TECO conditionals. In TECO mode on a terminal with a Meta key, it may be useful to set the TECO flag FS CTLMTA♦ which causes Control-Meta commands to insert Control characters. See section 22.5 [FS Flags], page 113.

PL1 mode is for editing PL1 code, and causes Tab to indent an amount based on the previous statement type. The body of the implementation of PL1 mode is in the library PL1, which is loaded automatically when necessary. See the file INFO:EPL1.INFO.

PASCAL mode is similar to PL1 mode, for PASCAL. It is in the library called PASCAL. See the file INFO:EPASC.INFO.

FORTRAN mode is implemented by the FORTRAN library. See the file INFO:EFORTRAN.INFO.

There are also modes for BLISS, BCPL, COBOL, and SAIL, but no documentation for them except that in the libraries themselves. Any volunteers to write some? Meanwhile, you can look at the documentation in the libraries. See section 22.2 [Libraries], page 108.

Chapter Twenty-One

The TAGS Package.

The TAGS package remembers the locations of the function definitions in a file and enables you to go directly to the definition of any function, without searching the whole file.

The functions of several files that make up one program can all be remembered together if you wish; then the TAGS package will automatically select the appropriate file as well.

21.1. How to Make a Tag Table for a Program

To use the TAGS package, you must create a tag table for the source file or files in your package. *Normally*, the tag table does not reside in any of those files, but in a separate tag table file which contains the names of the text files which it describes. Tag table files are generated by the TAGS program. The same program can be used to update the tag table if it becomes very far out of date (slight inaccuracies do not matter). Tag tables for INFO files work differently; the INFO file contains its own tag table, which describes only that file. See section 21.8 [INFO], page 106, for how to deal with them.

To make a tags table file for some source file or group of source files, you need to run the TAGS program which should reside somewhere on SYS: or, if not there, <EMACS>. When you run it, it will ask you for an output file. This is the file that will contain the tags of the source files. Usually you would specify something like FOO.TAGS if the source file is FOO.BAR, so that they will be grouped together in directory listings. For example:

```
@TAGS                          ; Runs the TAGS program
Output tags file:FOO.TAGS      ; Specify output file
Type filenames, end with blank line
*
```

After you specify the output file, TAGS asks you for the input files. You can give a number of files separated by commas, with wildcards allowed. Once you have done this, TAGS scans each input file and writes the data into the output file. For example:

```
Type filenames, end with blank line
*FOO.MAC
FOO.MAC.1 - 784. functions found.
*
FOO.TAGS.1 - 784. functions in 1. files.
@
```

Once each file is scanned, a message is typed indicating the number of "functions" (labels, procedures, routines etc.) that were actually found. Once it is through processing your input files, you can type another line full of input file names. If there are no more, type just a Return. The empty line of input tells TAGS to finish up and close the output file, which is now a usable tag table file.

The following languages are recognized by the TAGS program according to the extension of the input filename specified:

Language	Presumed extension
BLISS	BLI
BLISS11	B11
FAIL	FAI
FORTRAN	FOR
H316	H16
INTERLISP	ILSP
MACLISP	LSP
MACN11	M11
MACRO	MAC
MIDAS	MID
PAL11X	P11
SAIL	SAI
PASCAL	PAS
TECO	EMACS

If the extension you give is not recognizable, TAGS asks you to specify the complete language name as above.

Once a tag table file exists, you must updated it if you add new tags to the source files, or change them grossly. You can do this by invoking TAGS with the tab table filename as an argument:

```
@TAGS FOO.TAGS
```

TAGS finds the names and languages of the source files by reading the old tag table.

21.2. How to Tell EMACS You Want to Use TAGS

Before you can use the TAGS package, you must tell EMACS the name of the tags table file you want to use. This is done with the command

```
M-X Visit Tag Table♦ <filenames> <cr>
```

The extension of "TAGS" need not be mentioned.

EMACS can only know about one tag table file at a time, so doing a second M-X Visit Tag Table causes the first one to be forgotten (or written back if you have added definitions to it).

Giving M-X Visit Tag Table a nonzero numeric argument, as in

```
1 M-X Visit Tag Table◊ <filenames> <cr>
```

has the additional effect of setting the variable Tags Find File nonzero, which causes the TAGS package to use Find File rather than Visit File when it needs to switch files. This causes all the files to remain resident in the EMACS, in different buffers. In the default mode, visiting a tag in a different file read it in on top of the old file, in the same buffer (but it offers to write out changes if there are any). Warning: you can easily run out of address space by making too many buffers, this way.

Visit Tag Table is essentially equivalent to selecting the buffer *TAGS* and visiting the tag table file in that buffer, then returning to the previously selected buffer. Afterwards, M-X List Buffers will show the buffer *TAGS* visiting that file. The only difference is that Visit Tag Table causes the TAGS library to be loaded.

21.3. Jumping to a Tag

To jump to the definition of a function, use the command Meta-Period <tag name> <cr>. You will go straight to the definition of the tag. If the definition is in a different file then TAGS visits that file. If it is in the same file, TAGS leaves the mark behind and prints "^@" in the echo area.

If Meta-Period is used before M-X Visit Tag Table has been done, it asks for the name of a tag table file. After you type this name and a <cr>, you type the name of the tag as usual.

You do not need to type the complete name of the function; any substring will do. But this implies that sometimes you won't get the function you intended. When that happens, C-U Meta-Period will find the "next" function matching what you typed (next, in the order of listing in the tag table). Thus, if you wanted to find the definition of X-SET-TYPE-1 and you said just TYPE-1, you might find X-READ-TYPE-1 instead. You could then type C-U Meta-Period's until you reached X-SET-TYPE-1.

If you want to make sure you reach a precise function the first time, you should just include a character of context before and after its name. Thus, in a Lisp program, put a space before and after the function name. In a MIDAS program, put a linefeed before it and a colon after.

21.4. Other Operations on Tag Tables

21.4.1. Adding a New Function to a Tag Table

When you define a new function, its location doesn't go in the tag table automatically. That's because EMACS can't tell that you have defined a function unless you tell it by invoking the function ^R Add Tag. Since the operation of adding a tag to a tag table has proved not to be very necessary, this function no longer placed on any character, by default. You can invoke with M-X or connect it to a character if you like. For this section, let's assume you have placed it on C-X Period.

When you type the command C-X Period, the pointer should be on the line that introduces the function definition, after the function name and the punctuation that ends it. Thus, in a Lisp program, you might type "(DEFUN FOO " (note the space after FOO) and then type the C-X Period. In a MIDAS program, you might give the C-X Period after typing "FOO:". In a TECO program in EMACS format, you might type C-X Period after "!Set New Foo:!".

^R Add Tag modifies only the copy of the tag table loaded into EMACS. To modify the tag table file itself, you must cause it to be saved. Do this by selecting the buffer *TAGS* and saving it with C-X C-S, or with M-X Save All Files.

Although local modifications to a file do not degrade the efficiency of the TAGS package or require that the tag table be updated with TAGS, moving a function a great distance make it much slower to find that function. In this case, you can "add" the function to the tag table with C-X Period to give the table its new location. Or you can just run TAGS again to update everything, as is usually done..

21.4.2. How to Process All the Files in a Tag Table

The TAGS package contains a function M-X Next File which visits, one by one, all the files described by the selected tag table. This is useful when there is something to be done to all of the files in the package. To start off the sequence, do C-U 1 M-X Next File, which visits the first file. When you are finished operating on one file, do M-X Next File (no argument) to see the next. When all the files have been processed, M-X Next File♦ gives an error.

The files of the package are visited in the order that they are mentioned in the tag table, and the current place in the sequence is remembered by the pointer in the buffer *TAGS* which holds the tag table. Thus, if you visit a tag in a different file in the middle of a M-X Next File sequence, you will screw it up unless you return to the proper file again by visiting a tag (or go into the buffer *TAGS* and reset the pointer). However, visiting any other files directly, not using TAGS, does not interfere with the sequence, and the next M-X Next File will go just where it would have gone.

Next File is also useful as a subroutine in functions that wish to perform an automatic transformation (such as a Query Replace) on each file. Such functions should call Next File with a precomma argument as in 1,M(M.M Next File♦) or 1,1M(M.M Next File♦). The precomma argument tells Next File to return 0 instead of giving an error when there are no more files to process. Normally, it returns -1.

Here is an example of TECO code to do a Query Replace on all of the files listed in the visited tag table:

```
1M(M.M Next File♦)
< M(M.M Query Replace♦)FOO♦BAR♦
  1,M(M.M Next File♦);>
```

Tags Search and Tags Query Replace (see below) both work using Next File.

21.4.3. Multi-File Searches and Replacements

The TAGS package contains a function Tags Search which will search through all of the files listed in the visited tag table in the order they are listed. Do

```
M-X Tags Search◆<string><cr>
```

to find every occurrence of <string>. <string> is a TECO search string in which special TECO search characters such as ↑O, ↑X, ↑N, ↑B, and ↑Q are allowed. See section 19.3 [TECO Search Strings], page 85.

When M-X Tags Search reaches the end of the buffer, it visits the next file automatically, typing its name in the echo area. As soon as M-X Tags Search finds one occurrence, it returns. But it defines the command Control-Period to resume the search from wherever point is.

M-X Tags Query Replace does a Query Replace over all the files in a tag table. Like M-X Tags Search, it sets Control-. up to be a command to continue the Query Replace, in case you wish to exit, do some editing, and then resume scanning.

With Tags Find File set nonzero, Tags Search or Tags Query Replace could easily require more buffers than EMACS has room for. To prevent such a problem, they do not always put each file in a separate buffer. If Tags Search or Tags Query Replace wants to search a file which is already visited in some buffer, it uses the copy in that buffer. But if the file is not present, and Tags Find File is 1, then instead of visiting it in its own buffer, they visit it in a buffer named *Tags Search*. So at most one new buffer is created. If Tags Find File is 2, a new buffer is created for each file.

The library MQREPL enables you to use Next File to repeat a sequence of many Query Replace commands over a set of files, performing all the replacements on one file at a time.

21.4.4. Miscellaneous Applications of Tags

M-X List Tags◆<file><cr> lists all the tags in the specified file. Actually, all the files in the tag table whose names contain the string <file> are listed.

M-X Tags Apropos◆<pat><cr> lists all known tags whose names contain <pat>.

M-X Tags File List inserts in the buffer a list of the files known in the visited tag table.

M-X Tags Rescan runs TAGS over the visited tag table and revisits it. This is the most convenient way to update the tag table.

M-X View Arglist◆<tag><cr> lets you look briefly at the line on which a tag is defined, and at the lines of comments which precede the definition. This is a good way to find out what arguments a function needs. The file is always loaded into a separate buffer, when this command is used.

M-X What Tag? tells you which function's definition you are in. It looks through the tag table for the tag which most nearly precedes point.

21.5. What Constitutes a Tag

In MacLisp code, a function definition must start with an "(" at the beginning of a line, followed immediately with an atom which starts with "DEF" (and does not start with "DEFP"), or which starts with "MACRO", or which starts with "ENDF". The next atom on the line is the name of the tag. If there is no second atom on the line, there is no tag.

In MIDAS code, a tag is any symbol that occurs at the beginning of a line and is terminated with a colon or an equal sign. MIDAS mode is good for MACRO-10 also.

FAIL code is like MIDAS code, except that one or two ↓'s or "^"'s are allowed before a tag, and spaces are allowed between the tag name and the colon or equal sign, and _ is recognized as equivalent to =.

PALX code is like MIDAS code, except that spaces are allowed between a tag and the following colon or equals, and local tags such as "10$" are ignored.

In TECO code, a tag starts with an "!" and ends with a ":!". There may be any number of tags on a line, but the first one must start at the beginning of a line.

In BLISS and BLISS11 code, a tag starts with "GLOBAL" followed by "ROUTINE" or "FUNCTION", or just a "ROUTINE" or "FUNCTION", and ends with "=". The "FUNCTION" identifier is only relevant in BLISS-10.

In FORTRAN code, a tag starts with "SUBROUTINE", "FUNCTION", or "PROGRAM" and ends with the end of the line.

In INTERLISP code, a tag starts with (DEFINEQ and ends where the function ends. Nested functions are handled properly.

In INFO code, (e.g. files that are used for the INFO documentation subsystem), a tag starts with "Node:" and ends at the first ",".

In SAIL code, a tag starts with one of the following: "SIMPLE", "RECURSIVE", "POINTER", "BOOLEAN", "INTEGER", "REAL", "STRING", "INTERNAL" and is followed by "PROCEDURE" and ends with the first ";".

In PASCAL code, a tag starts with either "PROCEDURE" or "FUNCTION" and ends with the first ";".

21.6. Adding or Removing Source Files

A tag table file is a sequence of entries, one per file. Each entry looks like

```
<filenames>
<count>,<language>
<data lines>
↑_
```

<filenames> are the fully defaulted names of the file, <language> is one of the languages that TAGS knows how to process, and <data lines> are the actual tag information (described below). The CRLF after each ↑_ *must* be present. You can omit both the last ↑_ and its CRLF together, however.

A tags table file is for the most part an ordinary ASCII file, and any changes you make in it, including changes to the source files' names, will do what they appear to do.

The one exception is that each entry contains a count, in decimal, of the number of characters in it, including the ↑_ and CRLF. If you edit the contents of an individual source file's entry, and change its length, then the tag table is no good for use in editing until you run TAGS over it. TAGS ignores the specified count and always writes the correct count. If you are sure that the length is unchanged, or if you change the count manually, then running TAGS is not necessary, but you do so at your own risk. If you screw things up, use TAGS to fix the file.

Thus, if you are changing a source file's name, you should simply change the name where it is present in the tag table, and run TAGS over it if necessary.

To add a new source file, simply insert a dummy entry containing the filename, the language, a count which can be zero because TAGS will recompute it, and a ↑_. Then use TAGS to update the tag table. The dummy will turn into a real entry.

You can delete a source file from a tag table by deleting its entire entry. Since the counts of the remaining entries are still valid, you need not run TAGS over the file again. You can also change the order of the entries without doing any harm. The order of the entries matters if there are tags which appear in more than one source file.

You can edit everything else in the tag table too, if you want to. You might want to change a language name once in a while, but I doubt you will frequently want to add or remove tags, especially since that would all be undone by the next use of TAGS!

21.7. How a Tag Is Described in the Tag Table

A tag table file consists of one or more subunits in succession. Each subunit lists the tags of one source file. Each subunit has the overall format described in the previous section, containing zero or more lines describing tags. Here we give the format of each of those lines.

Starting with the third line of the tag table entry, each line describes a tag. It starts with a copy of the beginning of the line that the tag is defined on, up through the tag name and its terminating punctuation. Then there is a rubout, followed by the character position in decimal of the place in the line where copying stopped. For example, if a line in a MIDAS program starts with "FOO:" and the colon is at position 602 in the file, then the line describing it in the tag table would be

```
FOO:<rubout>603
```

One line can describe several tags, if they are defined on the same line; in fact, in that case, they must be on the same line in the tag table, since it must contain everything before the tag name on its definition line. For example,

```
!Foo:! !Bar:!
```

in a file of TECO code followed by character number 500 of the file would turn into

```
!Foo:! !Bar:!<rubout>500
```

EMACS will be able to use that line to find either FOO or BAR. TAGS knows how to create such things only for TECO files, at the moment. They aren't necessary in Lisp or MACSYMA files. In MIDAS files, TAGS simply ignores all but the first tag on a line.

21.8. Tag Tables for INFO Structured Documentation Files

INFO files are divided up into nodes, which the INFO program must search for. Tag tables for these files are designed to make the INFO program run faster. Unlike a normal tag table, the tag table for an INFO file resides in that file and describes only that file. This is so that INFO, when visiting a file, can automatically use its tag table if it has one. INFO uses the tag tables of INFO files itself, without going through the normal TAGS package, which has no knowledge of INFO file tag tables. Thus, INFO file tag tables and normal ones resemble each other only in their appearance and purpose. In use, they are unrelated.

To create a tag table in an INFO file, you must first put in a skeleton. This skeleton must be very close to the end of the file (at most 8 lines may follow it, or INFO will not notice it), and it must start on the line following a ↑_ or ↑_↑L which ends a node. Its format is as follows:

```
↑_↑L
Tag Table:
↑_
End Tag Table
```

No nodes may follow the tag table, or ITAGS will not put them in it. ITAGS is one pass and after writing the tag table into the file it copies the rest of the input file with no processing.

To turn the skeleton into the real thing, or to update the tag table, run the ITAGS program.

```
@ITAGS <info file name>
```

Once the tag table is constructed, INFO will automatically make use of it. A tag in an INFO file is just a node; whatever follows "Node:" on a line whose predecessor contains a "↑_" is taken to be a tag. The character which terminates the node name, which may be a comma, tab, or CRLF, is not included in the tag table. Instead, the rubout comes right after the tag name. This is to make it easy for INFO to demand an exact match on node names, rather than the substring match which the TAGS package normally uses.

Tag tables in INFO files must be kept close to up to date. INFO will not find the node if its start has moved more than 1000 characters before the position listed in the tag table. For best results, you should update an INFO file's tag table every time you modify more than a few characters of it.

Chapter Twenty-Two

Simple Customization

In this chapter we describe the many simple ways of customizing EMACS without knowing how to write TECO programs.

22.1. Minor Modes

Minor modes are options which you can use or not. For example, Auto Fill mode breaks lines between words as you type. All the minor modes are independent of each other and of the selected major mode. Most minor modes say in the mode line when they are on.

Each minor mode is the name of the function that can be used to turn it on or off. With no argument, the function turns the mode on if it was off and off if it was on. This is known as *toggling*. A positive argument always turns the mode on, and an explicit zero argument or a negative argument always turns it off. All the minor mode functions are suitable for connecting to single or double character commands if you want to enter and exit a minor mode frequently.

Auto Fill mode allows you to type text endlessly without worrying about the width of your screen. Line separators are be inserted where needed to prevent lines from becoming too long. See section 11.4 [Filling], page 50.

Auto Save mode protects you against system crashes by periodically saving the file you are visiting. Whenever you visit a file, auto saving is enabled if Auto Save Default is nonzero; in addition, M-X Auto Save allows you to turn auto saving on or off in a given buffer at any time. See section 13.3 [Auto Save], page 59.

Atom Word mode causes the word-moving commands, in Lisp mode, to move over Lisp atoms instead of words. Some people like this, and others don't. In any case, the s-expression motion commands can be used to move over atoms. If you like to use segmented atom names like FOOBAR-READ-IN-NEXT-INPUT-SOURCE-TO-READ, then you might prefer not to use Atom Word mode, so that you can use M-F to move over just part of the atom, or C-M-F to move over the whole atom.

Overwrite mode causes ordinary printing characters to replace existing text instead of shoving it over. It is good for editing pictures. For example, if the point is in front of the B in FOOBAR, then in Overwrite mode typing a G changes it to FOOGAR, instead of making it FOOGBAR as usual. Also, Rubout is changed to turn the previous character into a space instead of deleting it.

Word Abbrev mode allows you to define abbreviations that automatically expand as you type them. For example, "wam" might expand to "word abbrev mode". The abbreviations may depend on the major (e.g. Lisp, Text, ...) mode you are currently in. To use this, you must load the WORDAB library. See section 25 [Wordab], page 135.

Indent Tabs mode controls whether indentation commands use tabs and spaces or just spaces to indent with. Usually they use both, but you might want to use only spaces in a file to be processed by a program or system which doesn't ignore tabs, or for a file to be shipped to a system like Multics on which tab stops are not every 8 characters.

Most minor modes are actually controlled by variables. The mode is on if the variable is nonzero. Setting the minor mode with a command works by changing the variable. This means that you can turn the modes on or off with Edit Options, or make their values local to a buffer. See section 22.3 [Variables], page 109.

You could also put a minor mode in the local modes list of a file, but that is usually bad practice. This is because usually the preference for a minor mode is usually a matter of individual style rather than a property of the file per se. To make this more concrete, it is a property of a file that it be filled to a certain column, but use of Auto Fill mode to accomplish that is a matter of taste. So it would be good practice for the file to specify the value of Fill Column, but bad practice for the file to specify the value of Auto Fill Mode.

If you find yourself constantly tempted to turn on Auto Fill mode in local modes lists, what you probably really want is to have Auto Fill mode on whenever you are in Text mode. This can be accomplished with the following code in an EVARS file:

```
Text Mode Hook: 1M.LAuto Fill Mode♦
```

Suffice it to explain that this is TECO code to be executed whenever Text mode is entered, which makes the variable Auto Fill Mode local to the buffer with local value 1.

22.2. Libraries of Commands

All EMACS functions, including the ones described in this document, reside in libraries. A function is not accessible unless the library that contains it is loaded. Every EMACS starts out with two libraries loaded: the EMACS library, and the TWENEX library. These contain all of the functions described in this document, except those explicitly stated to be elsewhere. Other libraries are provided with EMACS, and can be loaded automatically or on request to make their functions available. See section [Catalogue], page 179, for a list of them.

To load a library, say M-X Load Library♦<libname><cr>. The library is found, either on your own directory or whichever one you specify, or on the EMACS directory, and loaded in. All the functions in the library are then available for use. Whenever you use M-X, the function name you specify is looked up in each of the libraries which you have loaded, more recently loaded libraries first. The first definition found is the one that is used.

For example, if you load the PICTURE library, you can then use M-X Edit Picture to run the Edit Picture function which exists in that library.

In addition to making functions accessible to M-X, the library may connect some of them to command characters. This is done by the library's & Setup function (See the file INFO:CONV.INFO, node Lib.). If you give Load Library an argument, the setup is not done.

You can also load a library temporarily, just long enough to use one of the functions in it. This avoids taking up space permanently with the library. Do this with the function Run Library, as in M-X Run♦<libname>♦<function name><cr>. The library <libname> is loaded in, and <function name> executed. Then the library is removed from the EMACS job. You can load it in again later.

M-X List Loaded Libraries types the names and brief descriptions of all the libraries loaded, last loaded first. The last one is always the EMACS library.

You can get a brief description of all the functions in a library with M-X List Library♦<libname><cr>, whether the library is loaded or not. This is a good way to begin to find out what is in a library that has no INFO documentation. Continue by loading the library and using Help D to inquire further about whichever functions looked interesting.

The function Kill Libraries can be used to discard libraries loaded with Load Library. (Libraries used with Run Library are discarded automatically). However, of all the libraries presently loaded, only the most recently loaded one can be discarded. Kill Libraries offers to kill each loaded library, most recently loaded first. It keeps killing libraries until you say to keep one library. Then it returns, because the remaining libraries cannot be deleted if that library is kept.

Libraries are loaded automatically in the course of executing certain functions. You will not normally notice this. For example, the TAGS library is automatically loaded in whenever you use M-. or Visit Tag Table for the first time. This process is known as *autoloading*. It is used to make the functions in the TAGS library available without the user's having to know to load the library himself, while not taking up space in EMACSes of people who aren't using them. It works by simply calling Load Library on the library known to be needed. Another kind of autoloading loads a library temporarily, the way Run Library does. This is done when you use the DIRED function, for example, since the DIRED library is not needed after the DIRED function returns. (This does not use Run Library; it uses M.A, which is what Run Library uses).

You can make your own libraries, which you and other people can then use, if you know how to write TECO code. See the file INFO:CONV.INFO, node Lib, for more details.

22.3. Variables

A variable is a name which is associated with a value, either a number or a string. EMACS uses many variables internally, and has others whose purpose is to be set by the user for customization. (They may also be set automatically by major modes.) One example of such a variable is the Fill Column variable, which specifies the position of the right margin (in characters from the left margin) to be used by the fill and justify commands.

The easiest way for the beginner to set a named variable is to use the function Edit Options. This shows you a list of selected variables which you are likely to want to change, together with their values, and lets you edit them with the normal editing commands in a recursive editing level. Don't make any changes in the names, though! Just change the values. Digits with maybe a minus sign stand for a numeric value of the variable, while string values are enclosed in doublequotes. Each option is followed by a comment which says what the option is for. Type the Help character for more information on the format used.

When you are finished, exit Edit Options using C-M-Z and the changes will take effect. If you decide not to make the changes, C-] gets out without redefining the options. See section 6.2 [Recursive Editing Levels], page 26.

If you give Edit Options a string argument, it shows you only the options whose names include the string. For example, M-X Edit Options♦Fill<cr> shows only the options that have "Fill" in their names. This is much more convenient, if you know what you plan to do.

However, Edit Options can be used only to set a variable which already exists, and is marked as an option. Some commands may refer to variables which do not exist in the initial environment. Such commands always use a default value if the variable does not exist. In these cases you must create the variable yourself if you wish to use it to alter the behavior of the command. You can use M-X Set Variable for this. You can set the variable to a numeric value by doing

```
C-U <number> M-X Set Variable♦<varname><cr>
```

or to a string by doing

```
M-X Set Variable♦<varname>♦<string><cr>
```

In fact, you can use Set Variable to set any variable, whether it exists already or not. For existing variables, it does not matter whether you use upper case or lower case letters, and you are allowed to abbreviate the name as long as the abbreviation is unique. If the variable might not exist yet, you must type the name in full. While either upper case or lower case will still work, you are encouraged to capitalize each word of the name for aesthetic reasons since EMACS stores the name as you give it.

To examine the value of a single variable, do

```
M-X View Variable♦<varname><cr>
```

If you want to set a variable a particular way each time you use EMACS, you can use an init file or an EVARS file. This is one of the main ways of customizing EMACS for yourself. An init file is a file of TECO code to be executed when you start EMACS up. They are very general, but writing one is a black art. You might be able to get an expert to do it for you, or modify a copy of someone else's. See the file INFO:CONV.INFO, node Init, for details. An EVARS file is a much simpler thing which you can do yourself. See section 22.6 [EVARS files], page 114.

Values of variables can be specified by the file being edited. For example, if a certain file ought to have a 50 column width, it can specify a value of 50 for the variable Fill Column. Then Fill Column will have the value 50 whenever this file is edited, *by anyone*. Editing other files is not affected. See section 22.7 [Locals], page 118, for how to do this.

You can get a list of all variables, not just those you are likely to want to edit, by doing M-X List Variables. Giving List Variables a string argument show only the variables whose names or values contain that string (like the function Apropos). M-X Describe can be given a variable's name instead of a function's name; it prints the variable's value and its documentation, if it has any.

You can also set a variable with the TECO command

```
<value> M.V <varname>♦
```

or

```
:I*<string>♦ M.V <varname>♦
```

This is useful in init files.

Any variable can be made local to a specific buffer with the TECO command M.L<variable name>♦. Thus, if you want the comment column to be column 50 in one buffer, whereas you usually like 40, then in the one buffer do M.LComment Column♦ using the minibuffer. Then, you can do 50U♦Comment Column♦ in that buffer and other buffers will not be affected. This is how local modes lists in files work.

Most local variables are killed (made no longer local) if you change major modes. They are therefore called *mode locals*. There are also *permanent* locals which are not killed by changing modes; use 2,M.L to create one. Permanent locals are used by things like Auto Save mode to keep internal information about the buffer, whereas mode locals are used for customizations intended only for one buffer. See the file INFO:CONV.INFO, node Variables, for information on how local variables work, and additional related features.

22.4. The Syntax Table

All the EMACS commands which parse words or balance parentheses are controlled by the *syntax table*. Each ASCII character has a word syntax and a Lisp syntax. By changing the word syntax, you can control whether a character is considered a word delimiter or part of a word. By changing the Lisp syntax, you can control which characters are parentheses, which ones are parts of symbols, which ones are prefix operators, and which ones are just ignored when parsing s-expressions.

The syntax table is actually a string which is 128*5 characters long. Each group of 5 consecutive characters of the syntax table describe one ASCII character's syntax; but only the first three of each group are used. To edit the syntax table, use M-X Edit Syntax Table. But before we describe this command, let's talk about the syntax of the syntax table itself.

The first character in each group of five sets the word syntax. This can be either "A" or a space. "A" signifies an alphabetic character, whereas a space signifies a separator character.

The second character in each group is the Lisp syntax. It has many possible values:

A an alphabetic character

space	a whitespace or nonsignificant character
(	an open parenthesis
)	a close parenthesis
;	a comment starter
↑M	a comment ender
|	a string quote
/	a character quote
'	a prefix character

Thus, several characters can each be given the syntax of parentheses. The automatic display of matching feature uses the syntax table to decide when to go into operation as well as how to balance the parentheses.

The syntax of "prefix character" means that the character becomes part of whatever object follows it, or can also be in the middle of a symbol, but does not constitute anything by itself if surrounded by whitespace.

A character quote character causes itself and the next character to be treated as alphabetic.

A string quote is one which matches in pairs. All characters inside a pair of string quotes are treated as alphabetic except for the character quote, which retains its significance, and can be used to force a string quote or character quote into a string.

A comment starter is taken to start a comment, which ends at the next comment ender, suppressing the normal syntax of all characters between. Not all the commands which might be expected to know about comments do know about them; some obvious uses are not well defined. Also, the syntax table entry is not what controls the commands which deal specifically with comments. They use the variables Comment Start, Comment Begin, Comment End, etc. Only the indentation commands use the syntax table for this.

The third character in each group controls automatic parenthesis matching display. It is defined only for characters which have the Lisp syntax of close parentheses, and for them it should contain the appropriate matching open parenthesis character (or a space). If a close parenthesis character is matched by the wrong kind of open parenthesis character, the bell will ring. If the third syntax table character of a close parenthesis is a space, any open parenthesis is allowed to match it.

The fourth and fifth characters in each group should always be spaces, for now. They are not used. The reason they exist is so that word-wise indexing can be used on the PDP-10 to access the syntax of a character given in an accumulator.

Edit Syntax Table displays the syntax table broken up into labelled five-character groups. You can see easily what the syntax of any character is. You are not editing the table immediately, however. Instead, you are asked for the character whose syntax you wish to edit. After typing it, you are positioned at that character's five-character group. Overwrite mode is on, so you can simply type the desired syntax entries, which replace the old ones. You can also do arbitrary editing, but be careful not to change the position of anything in the buffer. When you exit the recursive editing level, you are asked for another character to position to. An Altmode at this point exits and makes the changes. A C-] at any time aborts the operation.

Many major modes alter the syntax table. Each such major mode creates its own

syntax table once and reselects the same string whenever the mode is selected, in any buffer. Thus, all buffers in Text mode at any time use the same syntax table. This is important because if you ever change the syntax table of one buffer that is in Text mode, you change them all. It is possible to give one buffer a local copy with a TECO program:

```
MM Make Local Q-Register♦..D♦W  :G..DU..D
```

The syntax tables belonging to the major modes are not preinitialized in EMACS; they are created when the major mode is invoked for the first time, by copying the default one and making specific changes. Thus, any other changes you have made in the default (Fundamental mode) syntax table at the beginning propagate into all modes' syntax tables unless those modes specifically override them.

After a major mode has created its own syntax table, that table is stored in the variable <modename> ..D. This makes a different variable for each major mode, since the mode name is part of the variable name. Further use of the major mode gets the syntax table from that variable. If you create the variable yourself before the first use of the major mode, the value you put there will be used.

TECO programs and init files can most easily change the syntax table with the function & Alter ..D (look at its documentation). The syntax table is kept in the q-register named ..D, which explains that name.

22.5. FS Flags

FS flags are variables defined and implemented by TECO below the level of EMACS. Some of them are options which control the behavior of parts of TECO such as the display processor. Some of them control the execution of TECO programs; you are not likely to want to change these. Others simply report information from inside TECO. The list of FS flags is fixed when TECO is assembled and each one exists for a specific purpose.

FS flags are used mostly by the TECO programmer, but some of them are of interest to the EMACS user doing minor customization. For example, FS ECHO LINES♦ is the number of lines in the echo area. By setting this flag you can make the echo area bigger or smaller.

To get the value of an FS flag, use the TECO command FS followed by the name of the flag, terminated by an Altmode. Spaces in the name of the flag are completely ignored, and case does not matter. Thus, FS Echo Lines♦= executed in the minibuffer prints the number of lines in the echo area, assuming it is a number. The easiest way to examine a flag's value with EMACS commands is

```
C-M-X View Variable<cr> (FS Echo Lines♦)<cr>
```

This works regardless of the type of value stored in the FS flag.

To set the flag, give the FS command a numeric argument (which must be a string pointer, if the intended value is a string). For example, in the minibuffer or an init file, do

```
2FS Echo Lines♦
```

Be warned that FS always returns a value, so put a CRLF after it to discard the value if necessary.

It is possible to make an FS flag's value local to a buffer. See the file INFO:CONV.INFO, node Vars.

The documentation of individual FS flags can be found through Help T. Help T FS Echo Lines<cr> prints the description of FS ECHO LINES♦. Spaces are not significant in Help T either. A list of just the names of all FS flags is printed by the function List TECO FS Flags, found in the library PURIFY.

22.6. Init Files and EVARS Files

EMACS is designed to be customizable; each user can rearrange things to suit his taste. Simple customizations are primarily of two types: moving functions from one character to another, and setting variables which functions refer to so as to direct their actions. Beyond this, extensions can involve redefining existing functions, or writing entirely new functions and creating sharable libraries of them.

The most general way to customize is to write an init file, a TECO program which is executed whenever you start EMACS. The init file is found by looking for a particular filename, <your directory>EMACS.INIT. This method is general because the program can do anything. It can ask you questions and do things, rather than just setting up commands for later. However, TECO code is arcane, and only a few people learn how to write it. If you need an init file and don't feel up to learning to write TECO code, ask a local expert to do it for you. See the file INFO:CONV.INFO, for more about init files.

However simple customizations can be done in a simple way with an EVARS file. Such a file serves the same sort of purpose as an init file, but instead of TECO code, it contains just a list of variables and values. Each line of the EVARS file names one variable or one command character and says how to redefine it. Empty lines, and lines starting with spaces, are ignored. They can be used as comments. Your EVARS file is found by its filename, as an init file is, but it should be called EMACS.VARS instead of EMACS.INIT. You can have both an init file and an EVARS file if you want, as long as your init file calls the default init file, since that is what processes the EVARS file.

To set a variable, include in the EVARS file a line containing the name of the variable, a colon, and the value. If you want a string as a value, give the string; if you want a number as a value, give the digits with an optional minus sign. (If you happen to want a value which is a string of all digits, you are out of luck.) *Do not* put spaces around the colon for visual effect. Space before the colon is part of the variable name, and space after the colon is part of the value of the variable. Examples:

```
Comment Column:70
Comment Start:;
MM Foo:FTFOO♦
```

The last line defines a variable named MM Foo, which has the effect of defining a function named Foo with the specified value as its definition.

To redefine a command character is a little more complicated. Instead of the name

of a variable, give a ↑R (control-R) followed by the character. Since the general Control and Meta character cannot be part of a file, all Control and Meta characters are represented in a funny way: after the ↑R put the residue of the character after removing the Control and Meta, and before the ↑R put periods, one for Control, two for Meta, and three for Control-Meta. Thus, C-D is represented by ".↑RD" and C-M-; is represented by "...↑R;". Lower case characters such as C-a are usually defined as "execute the definition of the upper case equivalent". Therefore, by redefining the C-A command you also change C-a; but if you redefine C-a, by saying ".↑Ra" instead of ".↑RA", you will not change C-A. So be careful about case.

Instead of the value of a variable, for command character redefinition you must give a TECO expression that returns the desired definition. This is to make it easy to use any function whose name you know, because M.MFOO♦ is an expression that returns the definition of the function FOO. Example:

```
.↑RK: M.M^R Kill Line♦
```

would give C-K the definition that it normally has. Remember that in names of functions the "^R" is actually a "^" and an R, not a control R. The space before the M.M does not hurt in this case because it is ignored by TECO expression execution.

Some non-printing characters are a little tricky to redefine. For example, you must know that Return, Linefeed, Tab, Backspace and Altmode are not the same in TECO's command character set as C-M, C-J, C-I, C-H and C-[, even though in ASCII they are synonymous. By saying .↑RJ you will redefine C-J; by saying ↑R followed by a Linefeed (which you must insert in the EVARS file by typing C-Q Linefeed) you can redefine Linefeed. Normally, C-J is defined as "execute the definition of Linefeed", so you are better off redefining Linefeed.

You can also redefine a subcommand of a prefix character such as C-X. For this, you have to know where the character's dispatch table is stored. For C-X, the location of the dispatch is called ".X"; you won't have any other prefix characters unless you define them yourself. See the file INFO:CONV.INFO, node Prefix. Knowing the location, you specify the subcommand by writing :location(↑^character). This looks silly, but it is a TECO expression with the right meaning. For example, redefining C-X C-S, the location is ".X" and the character is ↑S, so we say

```
:.X(↑^↑S): M.M^R Save File♦
```

This gives C-X C-S the definition that it normally has. The subcommand character (↑S in this case) can represent itself in the EVARS file with no need for dots, because subcommand characters are just ASCII, with no Meta allowed.

To simply load a library you can write a definition for "*". Such a definition is ignored except that the value you specify is executed as a TECO expression. Thus, an arbitrary TECO expression can be snuck into an EVARS file. To load the library FOO, use the expression MM Load♦FOO♦.

```
*: MM Load Library♦FOO♦
```

Once the library is loaded, you can connect the functions in it to commands as described above.

Please refrain from giving newcomers to EMACS a copy of your own init file before they understand what it does. Everyone prefers his own customizations, and there is

always a tendency to proselytize, but by the same token your protege's tastes may be different from yours. If you offer him your customizations at the time when he is ready to understand what difference they make and decide for himself what he prefers, then you will help him get what *he* wants. Tell him about each individual change you made, and let him judge them one by one. There is no reason for him to choose all or nothing.

22.6.1. EVARS File Examples

Here are some examples of how to do various useful things in an EVARS file.

This causes new buffers to be created in Lisp mode:

```
Default Major Mode:LISP
```

This causes new buffers to have Auto Fill mode turned on:

```
Buffer Creation Hook: 1M.L Auto Fill Mode♦
```

This causes all Text mode buffers to have Auto Fill mode turned on:

```
Text Mode Hook: 1M.L Auto Fill Mode♦
```

This causes C-M-G to be undefined by copying the definition of C-| (which is undefined):

```
...↑RG: Q.↑R|
```

This redefines C-S to be a single character search command, and M-S to be a non-incremental string search:

```
.↑RS: M.M ^R Character Search♦
..↑RS: M.M ^R String Search♦
```

This redefines C-X V to run View File:

```
:.X(↑^V): M.M View File♦
```

This makes M-M a prefix character and defines M-M W to mark a word and M-M P to mark a paragraph. It stores the dispatch vector for the prefix character in q-register .Y.

```
..↑RM: MM Make Prefix Character♦.Y♦
:.Y(↑^W): M.M ^R Mark Word♦
:.Y(↑^P): M.M ^R Mark Paragraph♦
```

This loads the library LUNAR and defines C-Q to run a useful function in that library:

```
•: MM Load Library♦LUNAR♦
.↑RQ: M.M ^R Various Quantities♦
```

This causes Auto Save mode to save under the visited filenames:

```
Auto Save Visited File:1
```

This causes TAGS to bring new files into separate buffers:

```
TAGS Find File:1
```

This stops the message "EMACS version nnn. Type ... for Help" from being printed.

```
Inhibit Help Message:1
```

This redefines the list syntax of "%" to be ";" for "comment starter", and that of ";" to be "A" for "alphabetic":

```
*: 1mm& Alter ..D♦%;;A♦
```

22.6.2. Init File Examples

Here are the ways to do exactly the same things in an init file. Don't put more than one of these TECO expressions on a line, or the first may leave behind a value which will affect the operation of the second!

This causes new buffers to be created in Lisp mode:

```
:I♦Default Major Mode♦LISP♦
```

This causes new buffers to have Auto Fill mode turned on:

```
:I* 1M.L Auto Fill Mode↑]♦ ♦ M.VBuffer Creation Hook♦
```

It is different because the variable does not already exist. Note the ↑] used for getting the Altmode into the value.

This causes all Text mode buffers to have Auto Fill mode turned on:

```
:I* 1M.L Auto Fill Mode↑]♦ ♦ M.VText Mode Hook♦
```

This causes C-M-G to be undefined by copying the definition of C-| (which is undefined):

```
Q.↑R| U...↑RG
```

This redefines C-S to be a single character search command, and M-S to be a non-incremental string search:

```
M.M ^R Character Search♦ U.↑RS
M.M ^R String Search♦ U..↑RS
```

This redefines C-X V to run View File:

```
M.M View File♦ U:.X(↑^V)
```

This makes M-M a prefix character and defines M-M W to mark a word and M-M P to mark a paragraph. It stores the dispatch vector for the prefix character in q-register .Y.

```
MM Make Prefix Character♦.Y♦U..↑RM
M.M ^R Mark Word♦ U:.Y(↑^W)
M.M ^R Mark Paragraph♦ U:.Y(↑^P)
```

This loads the library LUNAR and defines C-Q to run a useful function in that library:

```
MM Load Library♦LUNAR♦
M.M ^R Various Quantities♦ U.↑RQ
```

This causes Auto Save mode to save under the visited filenames:

```
1U♦Auto Save Visited File♦
```

Compare this and the next example with the first two, in which string values are used.

This causes TAGS to bring new files into separate buffers:

```
1M.VTAGS Find File♦
```

This stops the message "EMACS version nnn. Type ... for Help" from being printed.

```
1M.VInhibit Help Message♦
```

This redefines the list syntax of "%" to be ";" for "comment starter", and that of ";" to be "A" for "alphabetic":

```
1mm& Alter ..D♦%;;A♦
```

22.7. Local Variables in Files

By putting a *local modes list* in a file you can cause certain major or minor modes to be set, or certain character commands to be defined, whenever you are visiting it. For example, EMACS can select Lisp mode for that file, or it can turn on Auto Fill mode, set up a special Comment Column, or put a special command on the character C-M-Comma. Local modes can specify the major mode, and the values of any set of named variables and command characters. Local modes apply only while the buffer containing the file is selected; they do not extend to other files loaded into other buffers.

The simplest kind of local mode specification sets only the major mode. You put the mode's name in between a pair of "-*-"'s, anywhere on the first nonblank line of the file. For example, the first line of this file contains -*-Text-*-, implying that this file should be edited in Text mode. The -*- can appear on the first nonblank line after the edit history, if somebody insists on putting in an edit history.

Often EMACS is able to determine the best major mode for a file by looking at the file's extension. If this works, you don't need to worry about specifying the major mode. If the extension of the file does not inform EMACS correctly, then you need an explicit local modes specification. The functions which implement this are called & <extension> Mode, in the TWENEX library.

To specify more that just the major mode, you must use a *local modes list*, which goes in the *last* page of the file (it is best to put it on a separate page). The local modes list starts with a line containing the string "Local Modes:", and ends with a line containing the string "End:". In between come the variable names and values, just as in an EVARS file. See section 22.6 [EVARS files], page 114.

The line which starts the local modes list does not have to say just "Local Modes:". If there is other text before "Local Modes:", that text is called the *prefix*, and if there is other text after, that is called the *suffix*. If these are present, each entry in the local modes list should have the prefix before it and the suffix after it. This includes the "End:" line. The prefix and suffix are included to disguise the local modes list as a comment so that the compiler or text formatter will not be perplexed by it. If you do

not need to disguise the local modes list as a comment in this way, do not bother with a prefix or a suffix.

Aside from the "Local Modes:" and the "End:", and the prefix and suffix if any, a local modes list looks like an EVARS file. However, comments lines are not allowed, and you cannot redefine C-X subcommands due to fundamental limitations of the data structure used to remember local variables. Sorry. See section 22.6 [EVARS files], page 114. for more information.

The major mode can be set by specifying a value for the variable "Mode" (don't try setting the major mode this way except in a local modes list!). It should be the first thing in the local modes list, if it appears at all. A function M-X Foo can be defined locally by putting in a local setting for a variable named "MM Foo". See section 5.2 [Functions], page 22.

Here is an example of a local modes list:

```
;;; Local Modes: ***
;;; Mode:Mumble ***
;;; Comment Column:0 ***
;;; Comment Start:;;;  ***
;;; Comment End:*** ***
;;; ..↑R/: m.m^R My Funny Meta-Slash♦ ***
;;; End: ***
```

Note that the prefix is ";;; " and the suffix is " ***". Note also that comments in the file begin with ";;; " and end with "***". Presumably the file contains code in the language Mumble, in which comments must start and end that way. The prefix and suffix are used in the local modes list to make the list appear as comments when the file is read by the Mumble compiler.

The last page of the file must be no more than 10000 characters long or the local modes list will not be recognized. This is because EMACS finds the local modes list by scanning back only 10000 characters from the end of the file for the last formfeed, and then looking forward for the "Local Modes:" string. This accomplishes these goals: a stray "Local Modes:" not in the last page is not noticed; and visiting a long file that is all one page and has no local mode list need not take the time to search the whole file.

22.8. Keyboard Macros

C-X (	Start defining a keyboard macro.
C-X)	End the definition of a keyboard macro.
C-X E	Execute the most recent keyboard macro.
C-X Q	Ask for confirmation when the keyboard macro is executed.
C-U C-X Q	Allow the user to edit for a while, each time the keyboard macro is executed.
M-X Name Kbd Macro	Make the most recent keyboard macro into the permanent definition of a command.

A *keyboard macro* is a command defined by the user to abbreviate a sequence of

other commands. If you discover that you are about to type C-N C-D forty times, you can define a keyboard macro to do C-N C-D and call it with a repeat count of forty.

Keyboard macros differ from ordinary EMACS commands, in that they are written in the EMACS command language rather than in TECO. This makes it easier for the novice to write them, and makes them more convenient as temporary hacks. However, the EMACS command language is not powerful enough as a programming language to be useful for writing anything intelligent or general. For such things, TECO must be used.

EMACS functions were formerly known as macros (which is part of the explanation of the name EMACS), because they were macros within the context of TECO as an editor. We decided to change the terminology because, when thinking of EMACS, we consider TECO a programming language rather than an editor. The only "macros" in EMACS now are keyboard macros.

You define a keyboard macro while executing the commands which are the definition. Put differently, as you are defining a keyboard macro, the definition is being executed for the first time. This way, you can see what the effects of your commands are, so that you don't have to figure them out in your head. When you are finished, the keyboard macro is defined and also has been, in effect, executed once. You can then do the whole thing over again by invoking the macro.

22.8.1. Basic Use

To start defining a keyboard macro, type the C-X (command (^R Start Kbd Macro). From then on, your commands continue to be executed, but also become part of the definition of the macro. "Def" appears in the mode line to remind you of what is going on. When you are finished, the C-X) command (^R End Kbd Macro) terminates the definition (without becoming part of it!). The macro thus defined can be invoked again with the C-X E command (^R Execute Kbd Macro), which may be given a repeat count as a numeric argument to execute the macro many times. C-X) can also be given a repeat count as an argument, in which case it repeats the macro that many times right after defining it, but defining the macro counts as the first repetition (since it is executed as you define it). So, giving C-X) an argument of 2 executes the macro immediately one additional time. An argument of zero to C-X E or C-X) means repeat the macro indefinitely (until it gets an error).

If you wish to save a keyboard macro for longer than until you define the next one, you must give it a name. If you do M-X Name Kbd Macro♦FOO<cr>, the last keyboard macro defined (the one which C-X E would invoke) is turned into a function and given the name FOO. M-X FOO will from then on invoke that particular macro. Name Kbd Macro also reads a character from the keyboard and redefines that character command to invoke the macro. You can use a bit prefix character in specifying the command; you can also type a C-X command to be redefined. When you have finished typing the command characters, Name Kbd Macro asks you whether it should go ahead and redefine the character.

To examine the definition of a keyboard macro, use the function View Kbd Macro. Either supply the name of the function which runs the macro, as a string argument, or type the command which invokes the macro, on the terminal when View Kbd Macro asks for it.

22.8.2. Executing Macros with Variations

If you want to be allowed to do arbitrary editing at a certain point each time around the macro (different each time, and not remembered as part of the macro), you can use the C-U C-X Q command (^R Kbd Macro Query). When you are defining the macro, this lets you do some editing, which does *not* become part of the macro. When you are done, exit with C-M-Z to return to defining the macro. When you execute the macro, at that same point, you will again be allowed to do some editing. When you exit this time with C-M-Z, the execution of the macro will resume. If you abort the recursive editing level with C-], you will abort the macro definition or execution.

You can get the effect of Query Replace, where the macro asks you each time around whether to make a change, by using the command C-X Q with no argument in your keyboard macro. When you are defining the macro, the C-X Q does nothing, but when the macro is invoked the C-X Q reads a character from the terminal to decide whether to continue. The special answers are Space, Rubout, Altmode, C-L, C-R. A Space means to continue. A Rubout means to skip the remainder of this repetition of the macro, starting again from the beginning in the next repetition. An Altmode ends all repetitions of the macro, but only the innermost macro (in case it was called from another macro). C-L clears the screen and asks you again for a character to say what to do. C-R enters a recursive editing level; when you exit, you are asked again (if you type a Space, the macro will continue from wherever you left things when you exited the C-R). Anything else exits all levels of keyboard macros and is reread as a command.

Chapter Twenty-Three

The Minibuffer

The *minibuffer* is a facility by means of which EMACS commands can read input from the terminal, allowing you to use EMACS commands to edit the input while you are typing it. Usually it is used to read a TECO program to be executed.

M-Altmode	Invokes an empty minibuffer.
M-%	Invokes a minibuffer initialized with a Query Replace.
C-X Altmode	Re-execute a recent minibuffer command.
C-X ^	Add more lines to the minibuffer.
C-\	Meta-prefix for use in the minibuffer.
C-Z C-Y	Rotate ring of recent minibuffer commands.

The primary use of the minibuffer is for editing and executing simple TECO programs such as

```
MM Query Replace♦FOO
♦BAR
♦
```

(which could not be done with M-X because Returns are part of the arguments).

You can always tell when you are in a minibuffer, because the mode line contains something in parentheses, such as "(Minibuffer)" or "(Query Replace)". There is also a line of dashes across the screen a few lines from the top. Strictly speaking, the minibuffer is actually the region of screen above the line of dashes, for that is where you edit the input that the minibuffer is asking you for. Editing has been limited to a few lines so that most of the screen can continue to show the file you are visiting.

If you want to type in a TECO command, use the minibuffer with the command Meta-Altmode, (^R Execute Minibuffer). An empty minibuffer will appear, into which you should type the TECO command string. Exit with Altmode Altmode, and remember that neither of the two Altmodes is inserted into your TECO command although the first one may appear to be. When the TECO command is executed, "the buffer" will be the text you were editing before you invoked the minibuffer.

Often, a minibuffer starts out with some text in it. This means that you are supposed to add to that text, or, sometimes, to delete some of it so as to choose among several alternatives. For example, Meta-% (^R Query Replace) provides you with a minibuffer initially containing the string "MM Query Replace♦". The cursor comes at the end. You are then supposed to add in the arguments to the Query Replace.

In a minibuffer, you can edit your input until you are satisfied with it. Then you tell EMACS you are finished by typing two Altmodes. An Altmode not followed by another

Altmode is simply inserted in the buffer. This is because it is common to want to put Altmodes into the minibuffer, which usually contains a string of TECO commands. For example, in Meta-% (^R Query Replace) each argument must be ended by an Altmode. However, when you type two Altmodes in a row, neither one remains in the buffer. The two Altmodes do nothing to the text in the minibuffer, they just exit.

Since Altmode is self-inserting, typing Meta characters can be a problem. You can do it by using C-\ instead of Altmode as the Meta-prefix. If you type a Control-Meta character on your keyboard, the corresponding ASCII control character is inserted in the minibuffer. This is because the Lisp commands are rarely useful when editing TECO code, but insertion of control characters is frequent. If you really want to use a Control-Meta EMACS command, you must use C-Z to type it. You cannot use C-\ C-A to type C-M-A, because C-\ (unlike Altmode) ignores the Control bit of the following character, so you must use C-Z C-A. The motivation for this quirk of C-\ is that C-\ C-B (to obtain M-B) is easier to type than C-\ B, especially if it is typed several times in a row.

You can cancel your input in a minibuffer and start all over again by typing C-G. That kills all the text in the minibuffer. A C-G typed when the minibuffer is already empty exits from the minibuffer. Usually, this aborts whatever command was using the minibuffer, so it will return without doing anything more. For example, if you type two C-G's at Meta-%'s minibuffer, you will return to top level and no Query Replace will be done. Typing a single C-G at a preinitialized minibuffer to empty the buffer is not very useful, since you would have to retype all the initial text.

The last five distinct minibuffer commands or M-X commands you have issued are remembered in a ring buffer in q-register .M. The C-X Altmode command (^R Re-execute Minibuffer) re-executes the last command in the ring. With an argument <n>, it re-executes the <n>'th previous command. The command is printed out (only the first 40 characters or so) and you are asked to confirm with "Y" or "N".

You can also get your previous minibuffer and M-X commands back into the minibuffer to be edited and re-executed with changes. Giving M-Altmode and argument, as in C-U M-Altmode, causes the minibuffer to be loaded up with the last command in the ring, as if you had typed it in again from scratch. You can then edit it, execute it by typing two Altmodes, or cancel it with C-G. To get an earlier command string instead of the most recent one, use the command C-Z C-Y once you are in the minibuffer. This command "rotates" the ring of saved commands much as M-Y rotates the ring of killed text. Each C-Z C-Y reveals an earlier command string, until the ring has rotated all the way around and the most recent one reappears. C-Z C-Y is actually a way of saying C-M-Y, but in the minibuffer that's the only way to type it, since Altmode inserts itself and Control-Meta characters insert control characters.

If you exit from Meta-Altmode with a C-G, nothing is executed and the previous minibuffered command string is still remembered as the last one.

While in a minibuffer, if you decide you want the minibuffer to use more lines on the screen, you can use C-X ^ (^R Grow Window) to get more. It gets one more line, or as many lines as its argument says.

Chapter Twenty-Four

Correcting Mistakes and EMACS Problems

If you type an EMACS command you did not intend, the results are often mysterious. This chapter tells what you can do to cancel your mistake or recover from a mysterious situation. EMACS bugs and system crashes are also considered.

24.1. Quitting and Aborting

C-G Quit. Cancel running or partially typed command.

C-] Abort recursive editing level and cancel the command which invoked it.

M-X Top Level
Abort all recursive editing levels and subsystems which are currently executing.

There are three ways of cancelling commands which are not finished executing: *quitting* with C-G, and *aborting* with C-] or M-X Top Level. Quitting is cancelling a partially typed command or one which is already running. Aborting is cancelling a command which has entered a recursive editing level.

Quitting with C-G is used for getting rid of a partially typed command, or a numeric argument that you don't want. It also stops a running command in the middle in a relatively safe way, so you can use it if you accidentally give a command which takes a long time. In particular, it is safe to quit out of killing; either your text will *all* still be there, or it will *all* be in the kill ring (or maybe both). Quitting an incremental search does special things documented under searching; in general, it may take two successive C-G's to get out of a search. C-G can interrupt EMACS at any time, so it is not an ordinary command.

Aborting with C-] (Abort Recursive Edit) is used to get out of a recursive editing level and cancel the command which invoked it. Quitting with C-G cannot be used for this, because it is used to cancel a partially typed command within the recursive editing level. Both operations are useful. For example, if you are editing a message to be sent, C-G can be used to cancel the commands you use to edit the message, and C-] cancels sending the message. C-] either tells you how to resume the aborted command or queries for confirmation before aborting.

When you are in a position to use M-X, you can use M-X Top Level. This is

equivalent to "enough" C-] commands to get you out of all the levels of subsystems and recursive edits that you are in. C-] gets you out one level at a time, but M-X Top Level goes out all levels at once. Both C-] and M-X Top Level are like all other commands, and unlike C-G, in that they are effective only when EMACS is listening.

24.2. Dealing with Common Forms of EMACS Lossage

This section describes various conditions which can cause EMACS not to work, or cause it to display strange things, and how you can correct them.

24.2.1. Error Message

When EMACS prints an error message, it occupies the top line of the screen, ends with a "?", and is accompanied by the ringing of the bell. Space causes the error message to disappear and be replaced by the first line of text again. Any other command is executed normally as if there had been no error message (the error message disappears during the redisplay after the command). However, "?" enters the error handler, which can be used to inspect the function call stack. Type Help inside the error handler to get its documentation. Most users will not be interested in doing this.

24.2.2. Subsystems and Recursive Editing Levels

Subsystems and recursive editing levels are important and useful aspects of EMACS, but they can seem like malfunctions to the user who does not understand them.

If the mode line starts with a bracket "[" or a parenthesis "(", or does not start with the word "EMACS", then you have entered a subsystem (See section 6.1 [Subsystems], page 25.) or a recursive editing level (See section 6.2 [Recursive Editing Levels], page 26.).

In such a situation, first try typing C-]. This will get out of any recursive editing level and most subsystems. The usual mode line and text display will reappear. If C-] does not seem to have worked, type the Help character. Instead of printing "Doc (Type ? for Help)" in the echo area, it will print a list of the subsystem's commands. One of these should be a command to exit or abort.

If the above techniques fail, try restarting (see section 24.2.7).

24.2.3. Garbage on the Screen

If the data on the screen looks wrong, it could be due to line noise on input or output, a bug in the terminal, a bug in EMACS redisplay, or a bug in an EMACS command. To find out whether there is really anything wrong with your text, the first thing to do is type C-L. This is a command to clear the screen and redisplay it. Often this will display data which is more pleasing. Think of it as getting an opinion from another doctor.

24.2.4. Garbage Displayed Persistently

If EMACS persistently displays garbage on the screen, or if it outputs the right things but scattered around all the wrong places on the screen, it may be that EMACS has the wrong idea of your terminal type. The first thing to do in this case is to exit from EMACS and restart it. Each time EMACS is restarted it asks the system what terminal type you are using. Whenever you detach and move to a terminal of a different type you should restart EMACS as a matter of course. If you stopped EMACS with the exit command, or by interrupting it when it was awaiting a command, then this is sure to be safe.

The system itself may not know what type of terminal you have. You should try telling the system with the TERMINAL TYPE command in EXEC. If your terminal is compatible with one of the standard types but has a different size screen, you must tell the system the size with the TERMINAL LENGTH and TERMINAL WIDTH commands, because EMACS uses whatever size the system says it knows.

However, the system may not even have a type code defined for your terminal. In this case, as long as EMACS knows about your type of terminal, you can do M-X Set Terminal Type♦<type><cr> where <type> stands for the EMACS name of your type of terminal. Get a list of all types known by doing M-X List Library♦TRMTYP<cr>. EMACS will *still* get the size of the screen from the system, so you are not relieved of responsibility for using the TERMINAL WIDTH and TERMINAL LENGTH commands. Also, if you restart EMACS (as opposed to continuing it), you will have to specify the terminal type again, since EMACS will have asked the system again.

24.2.5. URK Error (Address Space Exhausted)

If attempting to visit a file or load a library causes an "URK" error, it means you have filled up the address space; there is no room inside EMACS for any more files or libraries. In this situation you can run M-X Make Space. This command compacts the data inside EMACS to free up some space. It also offers to discard data that may be occupying a lot of space, such as the kill ring (See section 9.1 [Killing], page 37.), the undo memory (See section 24.3 [Undo], page 128.), and buffers created by TAGS and INFO. Another way of freeing space is to kill buffers with M-X Kill Some Buffers (See section 14 [Buffers], page 67.) or unload libraries with M-X Kill Libraries (See section 22.2 [Libraries], page 108.).

Visiting a file causes an URK error if the file does not fit in the available virtual memory space, together with the other buffers and the libraries loaded. A big enough file causes an URK error all by itself. For editing such large files, use the command Split File (in the SPLIT library) to break it into subfiles. These will be fairly large files still, but not too large to edit. After editing one or more of the subfiles, use the command Unsplit File (also in SPLIT) to put them back together again.

M-X Split File takes the name of the file to split as an argument. The file is split into subfiles with the same first name as the original file, but with extensions "1", "2", etc., for as many subfiles as are needed depending on the size of the original file. These numeric extensions should not be confused with version numbers: a subfile FOO.1 would be created with version 1, and after editing you might get up to FOO.1.3. This

has nothing to do with the third subfile, FOO.3, which would have its own version number (perhaps FOO.3.2).

M-X Unsplit File takes the name of the file to merge into as an argument. It finds the subfiles the same way Split File makes them, by taking successive numbers as extensions. When a nonexisten extension is reached, Unsplit File assumes that means it has already processed all the subfiles and that it is finished.

24.2.6. All Type-in Echoes and Nothing Else Happens

If you find that EMACS is not responding to your commands except for echoing them all at the bottom of the screen, including the Return character, and that Rubout causes erased characters to be retyped instead of erased, then you have managed to exit from EMACS back to TECO. Often this follows an "Error in error handler" message which indicates that a condition arose in which the error handler could not function. You can get back into EMACS by typing :M..L↑↑, or by restarting (see below). If you ever *want* to exit back to TECO, you can do M-X Top Level with an argument greater than zero. Before using :M..L↑↑, get rid of any other characters you have typed by mistake by typing a C-G.

24.2.7. EMACS Hung and Not Responding

Sometimes EMACS gets hung and C-G does not work. The more drastic procedure of restarting EMACS may work at such times. C-G can fail to work because it only takes effect between the TECO commands which make up an EMACS program, never in the middle of one (only a few TECO commands allow quitting at any time), so as to prevent TECO's internal data structures from becoming inconsistent. If EMACS is hung inside a TECO command, C-G is not noticed, but restarting can still be tried.

To restart EMACS, type Control-C twice to stop EMACS, then START to restart it. While restarting TECO in this way is usually safe (especially at times when TECO is doing I/O), there are certain times at which it will cause the TECO data structures to be inconsistent, so do not try it unless other measures have failed.

Your ultimate safeguard against a wedged EMACS is to save your work frequently.

24.3. Undoing Changes to the Buffer

If you mistakenly issue commands that make a great change to the buffer, you can often undo the change without having to know precisely how it came about. This is done by using M-X Undo. Type M-X Undo<cr> and the change is undone. It does not matter if you have moved the cursor since you made the change; it is undone where it was originally done.

The first thing Undo does is tell you what kind of change it plans to undo (kill, fill, undo, case-convert, etc). Then it asks whether to go ahead. If you say "Y", the change is actually undone.

Not all changes to the buffer can be undone: deletion (as opposed to killing) can't

be, and changes in indentation can't be, nor can many forms of insertion (but they aren't as important since they don't destroy information). Also, a Replace String or Query Replace can't be undone, which is a shame. The reason is that actually they make many small changes, and Undo only knows how to remember one contiguous change. Perhaps someday I will be able to fix this.

As a result, when you say Undo, it may undo something other than the latest change if the latest change was not undoable. This might seem to pile one disaster on another, but it doesn't, because you can *always* Undo the Undo if it didn't help. But you can avoid even having to do that, if you look at what type of change Undo says it will undo.

If you want to undo a considerable amount of editing, not just the last change, the Undo command can't help you, but M-X Revert File (See section 13.2 [Revert], page 59.) might be able to. If you have been writing a journal file (See section 24.4 [Journals], page 129.), you can replay the journal after deleting the part that you don't want.

24.4. Journal Files

A journal file is a record of all the commands you type during an editing session. If you lose editing because of a system crash, an EMACS bug, or a mistake on your part, and you have made a journal file, you can replay the journal or part of it to recover what you lost. Journal files offer an alternative to auto saving, using less time and disk space if there is no crash, but requiring more time when you recover from a crash. See section 13.3 [Auto Save], page 59.

24.4.1. Writing Journal Files

In order to make a journal file, you must load the JOURNAL library and then execute M-X Start Journal File♦<filename><cr>. Immediately, most of the current status of EMACS is recorded in the journal file, and all subsequent commands are recorded as they are typed. This happens invisibly and silently. The journal file is made fully up to date on the disk after every 50th character, so the last 50 characters of type in is the most you can lose.

The default filenames for the journal file are EMACS.JOURNAL. There is rarely a reason to use any other name, because you only need one journal file unless you are running two EMACSes at the same time.

24.4.2. Replaying Journal Files

To replay the journal file, get a fresh EMACS, load JOURNAL, and do M-X Replay Journal File♦<filename><cr>. The filename can usually be omitted since normally you will have used the defaults when creating the journal.

After a delay while the files, buffers and libraries are loaded as they were when the journal file was written, EMACS will begin replaying the commands in the journal

before your very eyes. Unlike keyboard macros, which execute invisibly until they are finished, journal files display as they are executed. This allows you to see how far the replay has gone. You can stop the process at any time by typing C-G. Aside from that, you should not type anything on the keyboard while the replay is going on.

If the need for a replay is the result of a system crash or EMACS crash, then you probably want to replay the whole file. This is what happens naturally. If you are replaying because you made a great mistake, you probably want to stop the replay before the mistake. This is when it becomes useful to type C-G to stop the replay. Alternatively, you can edit the journal file, and delete everything from the point of the mistake to the end, before you replay it.

Once the replay is complete, save all your files immediately. Don't tempt fate!

If you quit with C-G in the middle of a command while writing a journal file, there is no way to record in the journal file how much of the command has already been completed. So, when the journal is replayed, EMACS has to ask you to fill in for it. The command which was interrupted will be replayed to completion; then, you are given a recursive editing level in which to restore the file to the desired state. This happens only if the C-G originally interrupted an executing command. C-G typed to discard an argument or partial command while EMACS is waiting for input can be and is replayed correctly without asking you for help.

24.4.3. Journal File Format

To edit a journal file, you must know the format. It is designed to be mostly transparent.

The primary problem which the journal file format has to solve is how to represent 9-bit command characters in a file which can contain only 7-bit ASCII characters. (We could have filled the journal file with 9-bit characters, but then you would not be able to print it out or edit it). The solution we have used is to represent each command by two characters in the file.

So, a Control character is represented by a caret ("^") followed by the basic character, as in "^E" for Control-E. This was chosen to be mnemonically significant. A Meta character is represented by "+" followed by the basic character, so that Meta-[is represented by "+[". A Control-Meta character is represented by "*" followed by the basic character, as in "*X" for C-M-X.

A command which is not Control or Meta is represented as a space followed by the command itself, except that Return is represented by a CRLF rather than a space and a carriage return. This prevents the journal file from being one huge line, and makes insertion of text very recognizable: the text inserted appears in the journal file alternating with spaces.

The Help character, which is not covered by the scheme as described so far, is represented by "??".

An asynchronous quit, which is a problem for replaying, is represented by a single character, a ↑G, while a synchronous quit, which can be replayed reliably, is represented by ":↑G". EMACS considers a quit synchronous, and uses ":↑G" to record it, if EMACS was waiting for terminal input when the C-G was typed.

Your commands themselves are not the only information in the journal file. EMACS records other information which is necessary in replaying the journal properly. The colon character ":" indicates a block of such information. Usually the extent of the block is easily recognizable because its contents do not resemble the representations of commands described above. A large block of information starting with a colon appears at the beginning of every journal file.

Colons are also used to record the precise effects of certain commands such as C-V whose actions depend on how the text was displayed on the screen. Since the effects of such commands are not completely determined by the text, replaying the command could produce different results, especially if done on a terminal with a different screen size. The extra information recorded in the journal makes it possible to replay these commands with fidelity.

A semicolon in the journal file begins a comment, placed there for the benefit of a human looking at the journal. The comment ends at the beginning of the following line.

24.4.4. Warnings

Proper replaying of a journal file requires that all the surrounding circumstances be unchanged.

In particular, replaying begins by visiting all the files that were visited when the writing of the journal file began; not the latest versions of these files, but the versions which were the latest at the earlier time. If those versions, which may no longer be the latest, have been deleted, then replaying is impossible.

If your init file has been changed, the commands when replayed may not do what they did before.

These are the only things that can interfere with replaying, as long as you start writing the journal file immediately after starting EMACS. But as an editing session becomes longer and files are saved, the journal file contains increasing amounts of waste in the form of commands whose effects are already safe in the newer versions of the edited files. Replaying the journal will replay all these commands wastefully to generate files identical to those already saved, before coming to the last part of the session which provides the reason for replaying. Therefore it becomes very desirable to start a new journal file. However, many more precautions must be taken to insure proper replaying of a journal file which is started after EMACS has been used for a while. These precautions are described here. If you cannot follow them, you must make a journal checkpoint (see below).

If any buffer contains text which is not saved in a file at the time the journal file is started, it is impossible to replay the journal correctly. This problem cannot possibly be overcome. To avoid it, M-X Start Journal File offers to save all buffers before actually starting the journal.

Another problem comes from the kill ring and the other ways in which EMACS remembers information from previous commands. If any such information which originated before starting the journal file is used after starting it, the journal file cannot be replayed. For example, suppose you fill a paragraph, start a journal file, and then

do M-X Undo? When the journal is replayed, it will start by doing M-X Undo, but it won't know what to undo. It is up to you not to do anything that would cause such a problem. It should not be hard. It would be possible to eliminate this problem by clearing out all such data structures when a journal file is started, if users would prefer that.

A more difficult problem comes from customization. If you change an option or redefine a command, then start a journal file, the journal file will have no record of the change. It will not replay correctly unless you remember to make the same change beforehand. Customizations made in an init file do not cause a problem because the init file has also been run when the journal file is replayed. Customizations made directly by the user while the journal file is being written are also no problem because replaying will make the same changes at the right times. However, a customization made while a journal file is being written *will* be a problem if a new journal file is started.

24.4.5. Journal Checkpoints

The only cure for the problems of starting a journal in mid-session is to record the complete state of EMACS at the time the journal is begun. This is not done normally because it is slow; however, you can do this if you wish by giving M-X Start Journal File a numeric argument. This writes the complete state of EMACS into the file ESAVE.EXE. To replay the journal, run ESAVE, the saved checkpoint, instead of EMACS; then load JOURNAL and do M-X Replay Journal File as described above. Be sure to delete the checkpoint if you are finished with it, since it tends to be large. Delete them also when you log out; it may be possible to have a command file which deletes them automatically when you log out. Checkpoint files more than a day old may be deleted by others without notice; but don't leave it up to them.

24.5. Reporting Bugs

Sometimes you will encounter a bug in EMACS. To get it fixed, you must report it. It is your duty to do so; but you must know when to do so and how if it is to be constructive.

24.5.1. When Is There a Bug

If EMACS executes an illegal instruction, or dies with an operating system error message that indicates a problem in the program (as opposed to "disk full"), then it is certainly a bug.

If EMACS updates the display in a way that does not correspond to what is in the buffer, then it is certainly a bug. If a command seems to do the wrong thing but the problem is gone if you type C-L, then it is a case of incorrect display updating.

Taking forever to complete a command can be a bug, but you must make certain that it was really EMACS's fault. Some commands simply take a long time. Quit or restart EMACS and type Help L to see whether the keyboard or line noise garbled the

input; if the input was such that you *know* it should have been processed quickly, report a bug. If you don't know, try to find someone who does know.

If a command you are familiar with causes an EMACS error message in a case where its usual definition ought to be reasonable, it is probably a bug.

If a command does the wrong thing, that is a bug. But be sure you know for certain what it ought to have done. If you aren't familiar with the command, or don't know for certain how the command is supposed to work, then it might actually be working right. Rather than jumping to conclusions, show the problem to someone who knows for certain.

Finally, a command's intended definition may not be best for editing with. This is a very important sort of problem, but it is also a matter of judgement. Also, it is easy to come to such a conclusion out of ignorance of some of the existing features. It is probably best not to complain about such a problem until you have checked the documentation in the usual ways (INFO and Help), feel confident that you understand it, and know for certain that what you want is not available. If you feel confused about the documentation instead, then you don't have grounds for an opinion about whether the command's definition is optimal. Make sure you read it through and check the index or the menus for all references to subjects you don't fully understand. If you have done this diligently and are still confused, or if you finally understand but think you could have said it better, then you have a constructive complaint to make *about the documentation*. It is just as important to report documentation bugs as program bugs.

24.5.2. How to Report a Bug

When you decide that there is a bug, it is important to report it and to report it in a way which is useful. What is most useful is an exact description of what commands you type, starting with a fresh EMACS just loaded, until the problem happens.

The most important principle in reporting a bug is to report *facts*, not hypotheses or conditions. It is always easier to report the facts, but people seem to prefer to strain to think up explanations and report them instead. If the explanations are based on guesses about how EMACS is implemented, they will be useless; we will have to try to figure out what the facts must have been to lead to such speculations. Sometimes this is impossible. But in any case, it is unnecessary work for us.

For example, suppose that you type C-X C-V <GLORP>BAZ.UGH<cr>, visiting a file which (you know) happens to be rather large, and EMACS prints out "I feel pretty today". The best way to report the bug is with a sentence like the preceding one, because it gives all the facts and nothing but the facts.

Do not assume that the problem is due to the size of the file and say "When I visit a large file, EMACS prints out 'I feel pretty today'". This is what we mean by "guessing explanations". The problem is just as likely to be due to the fact that there is a "Z" in the filename. If this is so, then when we got your report, we would try out the problem with some "big file", probably with no "Z" in its name, and not find anything wrong. There is no way in the world that we could guess that we should try visiting a file with a "Z" in its name.

Alternatively, the problem might be due to the fact that the file starts with exactly 25 spaces. For this reason, you should make sure that you don't change the file until we have looked at it. Suppose the problem only occurs when you have typed the C-X C-A command previously? This is why we ask you to give the exact sequence of characters you typed since loading the EMACS.

You should not even say "visit the file ..." instead of "C-X C-V" unless you *know* that it makes no difference which visiting command is used. Similarly, rather than saying "if I have three characters on the line", say "after I type <cr> A B C <cr> C-P", if that is the way you entered the text. A journal file containing the commands you typed to reproduce the bug is a very good form of report.

Send the bug report to BUG-EMACS@MIT-AI if you are on the Arpanet, or to the author (see the preface for the address).

If you are not in Fundamental mode when the problem occurs, you should say what mode you are in.

Be sure to say what version of EMACS and TECO are running. If you don't know, type Meta-Altmode Q♦EMACS Version♦= FS Version♦= ♦♦ and EMACS will print them out. (This is a use of the minibuffer. See section 23 [Minibuffer], page 123.)

If the bug occurred in a customized EMACS, or with several optional libraries loaded, it is helpful to try to reproduce the bug in a more standard EMACS with fewer libraries loaded. It is best if you can make the problem happen in a completely standard EMACS with no optional libraries. If the problem does *not* occur in a standard EMACS, it is very important to report that fact, because otherwise we will try to debug it in a standard EMACS, not find the problem, and give up. If the problem does depend on an init file, then you should make sure it is not a bug in the init file by complaining to the person who wrote the file, first. He should check over his code, and verify the definitions of the TECO commands he is using by looking in INFO.TECORD.INFO. Then if he verifies that the bug is in EMACS he should report it. We cannot be responsible for maintaining users' init files; we might not even be able to tell what they are supposed to do.

If you can tell us a way to cause the problem without reading in any files, please do so. This makes it much easier to debug. If you do need files, make sure you arrange for us to see their exact contents. For example, it can often matter whether there are spaces at the ends of lines, or a line separator after the last line in the buffer (nothing ought to care whether the last line is terminated, but tell that to the bugs). If you are reporting the bug from a non-Arpanet site, keep the files small, since we may have to *type them in*, unless you send them on mag tape.

If EMACS gets an operating system error message, such as for an illegal instruction, then you can probably recover by restarting it. But before doing so, you should make a dump file. Use the SAVE command to do this; however, this does not record the contents of the accumulators. To do that, use the EXEC commands EXAMINE 0, EXAMINE 1, etc., through EXAMINE 17. Include the numbers printed by these commands as part of your bug report. If you restart or continue the EMACS before saving this information, the trail will be covered and it will probably be too late to find out what happened.

A dump is also useful if EMACS gets into a wedged state in which commands that usually work do strange things.

Chapter Twenty-Five

Word Abbreviation Input

Word Abbrev mode allows the EMACS user to abbreviate text with a single "word", with EMACS expanding the abbreviation automatically as soon as you have finished the abbreviation, with control over capitalization of the expanded string.

Abbrevs are also useful for correcting commonly misspelled or mistyped words ("thier" could expand to "their"), and for uppercasing words like "EMACS" (abbrev "emacs" could expand to "EMACS").

To use this mode, just do M-X Word Abbrev Mode<cr>. (Another M-X Word Abbrev Mode<cr> will turn the mode off; it toggles.)

For example, in writing this documentation I could have defined "wam" to be an abbreviation for "word abbrev mode". After typing just the letters "wam", I see just that, "wam", but if I then finish the word by typing space or period or any other punctuation, the "wam" is replaced by (and redisplays as) "word abbrev mode". If I capitalize the abbrev, "Wam", the expansion is capitalized: "Word abbrev mode". If I capitalize the whole abbrev, WAM", each word in the expansion is capitalized: "Word Abbrev Mode". In this particular example, though, I would define "wam" to expand to "Word Abbrev mode" since it is always to be capitalized that way.

Thus, typing "I am in wam now" produces "I am in Word Abbrev mode now".

Word Abbrev mode does not interfere with the use of major modes, such as Text, Lisp, TECO, PL1, or minor modes, such as Auto Fill. Those modes (or the user) may redefine what functions are connected to characters; this does not hamper Word Abbrev mode.

There are two kinds of word abbreviations: mode and global. A *mode word abbrev* applies only in one major mode (for instance only in Text mode), while a global word abbrev applies regardless of major mode. If some abbrev is defined both as a mode word abbrev for the current mode and as a global word abbrev, the mode word abbrev expansion takes precedence.

For instance, you might want an abbrev "foo" for "find outer otter" in Text mode, an abbrev "foo" for "FINAGLE-OPPOSING-OPINIONS" in Lisp, and an abbrev "foo" for "meta-syntactic variable" in any other mode (the global word abbrev).

Word abbrevs can be defined one at a time (adding them as you think of them), or many at a time (from a definition list). You can save them in a file and read them back later. If you turn off Word Abbrev mode, abbrevs stop expanding automatically, but their definitions are not lost.

Word abbrevs can be killed, either singly or by editing the current definition list.

25.1. Basic Usage

C-X C-A	Define a mode abbrev for some text before point.
C-X +	Define a global abbrev for some text before point.
C-X C-H	Define expansion for mode abbrev before point.
C-X -	Define expansion for global abbrev before point.
C-M-Space	Expand abbrev without inserting anything.
M-'	Mark a prefix to be glued to an abbrev following.
C-X U	Unexpand the last abbrev, or undo a C-X U.

M-X List Word Abbrevs<cr>
: Shows definitions of all abbrevs.

M-X Edit Word Abbrevs<cr>
: Lets you edit the definition list directly.

M-X Read Word Abbrev File♦<filename><cr>
: Defines word abbrevs from a definition file.

M-X Write Word Abbrev File♦<filename><cr>
: Makes a definition file from current abbrev definitions.

Readable Word Abbrev Files
: Option variable to control abbrev file format.

This section describes the most common use of Word Abbrev mode. If you don't read any more than this, you can still use Word Abbrev mode quite effectively.

Note that each of the above commands will also work when Word Abbrev mode is turned off, unlike the automatic expanders (such as Space or Period), allowing you to manually define and expand abbrevs. (If you want to do this, you might also see the M-X Expand Word Abbrevs in Region command's self-documentation.)

25.1.1. Adding Word Abbrevs

C-X C-A (^R Add Mode Word Abbrev) defines a mode abbrev for the word before point (this does not include any punctuation between that word and point, though). It prints the word before point in the echo area and asks you for that word's abbreviation. Type the abbrev (which you may edit with Rubout and C-U) followed by a Return. The abbrev must be a "word"; it must contain only letters and digits; the case of the letters is irrelevant. If you'd rather define a global abbrev, use C-X + (^R Add Global Word Abbrev), which works similarly.

You can redefine an abbrev with C-X C-A or C-X +. If the abbrev already has a definition, it tells you what that was, and asks for confirmation.

To define an abbrev for more than one word of text, give C-X C-A or C-X + a numeric argument; an argument greater than 0 means the expansion is that many words before point; an argument of 0 means to use the region (between point and mark). (By using the region specification you can make an abbrev for any text, not just a sequence of words.) The message in the echo area provides you with confirmation of just what the expansion will be; you might see:

```
Text Abbrev for "this is the expansion":
```

Sometimes you may think you already had an abbrev for some text, use it, and see that it didn't expand. In this case, the C-X C-H (^R Inverse Add Mode Word Abbrev) or C-X - (^R Inverse Add Global Word Abbrev) commands are helpful: they ask you to type in an *expansion* rather than an abbrev. In addition to defining the abbrev, they also expand it. If you give them a numeric argument, n, they use the nth word before point as the abbrev.

You can kill abbrevs (cause them to no longer expand) by giving a negative numeric argument to C-X C-A or C-X +. For instance, to kill the global abbrev "foo" type C-U - C-X + foo<cr>.

25.1.2. Controlling Abbrev Expansion

When an abbrev expands, the capitalization of the expansion is determined by the capitalization of the abbrev: If the abbrev is all lowercase, the expansion is as defined. If the abbrev's first letter is uppercase, the expansion's first letter is too. If the abbrev is all uppercase, there are two possibilities: if the expansion is a single word, it is all-uppercased; otherwise, each of its words has its first letter uppercased (such as for use in a title).

Abbrevs normally expand when you type some punctuation character; the abbrev expands and the punctuation character is inserted. There are other ways of expanding abbrevs: C-M-Space (^R Abbrev Expand Only) causes the abbrev just before point to be expanded without inserting any other character. C-M-Space will expand abbrevs even if Word Abbrev mode is currently off; this can be useful if the system is slow, and you just want to manually expand a few abbrevs. M-' (^R Word Abbrev Prefix Mark) allows you to "glue" an abbrev onto any prefix: suppose you have the abbrev "comm" for "committee", and wish to insert "intercommittee "; type "inter", M-' (you will now see "inter-"), and then "comm "; "inter-comm " becomes "intercommittee ". M-X Expand Word Abbrevs in Region checks each word in the region and offers to expand each word abbrev found; for more details see its self-documentation. (It is similar to the M-X Query Replace command.)

25.1.3. Unexpanding Abbrevs

C-X U (^R Unexpand Last Word) "unexpands" the last abbrev's expansion, replacing the last expansion with the abbrev that caused it. If any auto-filling was done because of the expansion (you had Auto Fill mode on), that too is undone. If you type another C-X U, the first one is "undone" and the abbrev is expanded again. Only the last expansion can be undone. Sometimes you may find that C-X U unexpands an abbrev later than the one you're looking at. In this case, do another C-X U and go back and manually correct the earlier expansion.

If you know beforehand that a word will expand, and want to prevent it, you can simply "quote" the punctuation character with C-Q. For example, typing "comm", a C-Q, and then "." gives "comm." without expanding.

25.1.4. Listing Abbrevs

M-X List Word Abbrevs<cr> shows all currently defined abbrevs. An abbrev "foo" that expands to "this is an abbrev" in Text mode and has been expanded 3 times, is listed as:

```
foo:    (Text)  3       "this is an abbrev"
```

An abbrev "gfoo" which expands to "this is a global abbrev" in all modes, expanded 11 times, is listed as:

```
gfoo:           11      "this is a global abbrev"
```

Note that any use of the double-quote character (") inside an expansion is doubled, to distinguish the use of " from the "s that surround the whole expansion. Thus if the global abbrev 'helpc' expands to 'the "Help" character', it is listed as:

```
helpc:          3       "the ""Help"" character"
```

25.1.5. Editing the Definition List

M-X Edit Word Abbrevs places you in a recursive editing level, editing the current word abbrev definition list. The abbrevs appear in the same format used by M-X List Word Abbrevs. When you exit (via C-M-Z), the current word abbrevs are redefined from the edited definition list: any abbrevs that have been deleted from the list are killed, new ones added to the list are defined, and old ones changed are modified. In effect, after exiting the Edit Word Abbrev editing level, all previously-defined word abbrevs are killed, and the edited list is used to define new abbrevs. Typing C-] (Abort Recursive Edit) aborts Edit Word Abbrevs, without killing or redefining any abbrevs.

25.1.6. Saving Abbrev Definitions

M-X Write Word Abbrev File↑<filename><cr> writes an "abbrev definition file" which contains the definitions of all the abbrevs in your EMACS now. M-X Read Word Abbrev File↑<filename><cr> reads in such a file and defines the abbrevs. (Other abbrevs already defined are not affected unless the file redefines them.) If you don't supply a filename, the last file you used in either of these commands is used again, originally defaulting to WORDAB.DEFNS. With these two commands, you can save the abbrevs you defined in one EMACS and restore them in another EMACS another day. If you want abbrevs to be automatically saved when you exit EMACS (with C-X C-Z (^R Return to Superior)), set the option variable Save Word Abbrevs to 1. (They are saved only if the definitions have changed.)

The format of the definition file is designed for fast loading, not ease of human readability. (But if you have to, you can figure it out enough to read or even edit it.) If you want M-X Write Word Abbrev File to write a human-readable version instead, set the option Readable Word Abbrev Files to 1. (M-X Read Word Abbrev File will be able to read this format, but not as fast.)

If you have an EVARS file, you might want to put the following lines into it in order to turn on Word Abbrev mode, have your abbrev definition file automatically read when EMACS starts up, and enable automatic exit-saving:

```
*: 1 MM Word Abbrev Mode♦

*: MM Read Word Abbrev File♦WORDAB.DEFNS♦
Save Word Abbrevs:1
```

Or if you have an init file, use the following Teco code:

```
1 MM Word Abbrev Mode♦

MM Read Word Abbrev File♦WORDAB.DEFNS♦
1u♦Save Word Abbrevs♦
```

25.2. Advanced Usage

The use of Word Abbrev mode as discussed in the previous section suffices for most users. However, some users who use Word Abbrev mode a lot or have highly tailored environments may desire more flexibility or need more power to handle extreme situations than the basic commands provide.

25.2.1. Alternatives and Customizations

M-X Make Word Abbrev♦<abbrev>♦<expansion>♦<mode><cr>

M-X Kill All Word Abbrevs<cr>

M-X Make These Characters Expand♦<characters><cr>

M-X Attach Word Abbrev Keyboard Macro

^R Kill Mode Word Abbrev

^R Kill Global Word Abbrev

Only Global Abbrevs
: Set this option if you only use globals.

Additional Abbrev Expanders
: Variable for adding a few more expanders.

WORDAB Ins Chars
: Variable for replacing entire set of expanders.

The basic commands for defining a new mode abbrev, C-X C-A (^R Add Mode Word Abbrev) and C-X C-H (^R Inverse Add Mode Word Abbrev), work only in the current mode. A more general command is M-X Make Word Abbrev which takes three string arguments: the first is the abbrev, the second is the expansion, and the third is the mode (such as "Text"). This command can also define global abbrevs, by providing "*" as the mode name.

M-X Kill All Word Abbrevs<cr> is a very quick way of killing every abbrev currently defined. After this command, no abbrev will expand. (A slower but more careful way is with M-X Edit Word Abbrevs.)

The functions ^R Kill Mode Word Abbrev and ^R Kill Global Word Abbrev exist, but are not connected to any commands by default. If you find having to specify negative arguments to C-X C-A (^R Add Mode Word Abbrev) and C-X + (^R Add Global Word

Abbrev) inconvenient, you should connect these functions to characters. (See section 5.2 [Set Key], page 22. Or See section 22.6 [Init], page 114.)

If you prefer to use only global abbrevs then you should set the option variable Only Global Abbrevs to 1. You can do this after or before turning on Word Abbrev mode; it makes no difference. This causes the global abbrev definers which would otherwise be on C-X + (^R Add Global Word Abbrev) and C-X - (^R Inverse Add Global Word Abbrev) to be on the easier to type characters C-X C-A and C-X C-H. In addition, the checking done whenever you type an expander character (a punctuation character) is about three times faster for the no-expansion case, which is what happens most of the time.

Normally, the following characters cause expansion (followed by whatever they would normally do were Word Abbrev mode off; such as, insert themselves): !~@#; $%^&*-_=+[]()\|:'"{},<.>'/? and Space, Return, and Tab. You can, however, specify additional characters to cause expansion (digits, for instance, or greek letters on keyboards with Top-keys). M-X Make These Characters Expand♦<characters><cr> adds the characters in the string argument to the list of expanders. Alternatively, you can set the variable Additional Abbrev Expanders to contain the string of characters. (This is particularly useful in an init or EVARS file.) If you wish to completely replace the set of characters that cause expansion, set the variable WORDAB Ins Chars in your init file. See section 22.6 [init], page 114, for details on setting variables in init and EVARS files.

25.2.2. Manipulating Definition Lists

One reason you might want to manipulate the definition lists is to provide more structure to the definition environment than just the mode vs. global structure provided normally, such as to group together in a file those abbrevs pertaining to one topic.

M-X Insert Word Abbrevs<cr> inserts into the buffer a list of the current word abbrev definitions, in the format that M-X List Word Abbrevs uses. M-X Insert Word Abbrevs♦<string><cr> inserts some of the abbrevs' definitions; See section 25.2.3 [Many Abbrevs], page 140, for details.

M-X Define Word Abbrevs<cr> defines a set of word abbrevs from a definition list in the buffer. There should be nothing else besides the definition list in the buffer; or, if there is, you must narrow the buffer to just the definition list. See section 17 [Narrowing], page 77.

25.2.3. Dealing with Many Abbrevs

Some users build up a very large number of abbrevs. This causes a couple of problems: First, defining all those abbrevs when EMACS starts up can become too slow; this problem is discussed in the next section. Second, the commands that deal with the entire definition list become unwieldy.

M-X List Word Abbrevs♦<string><cr> shows you the definitions of just the abbrev definitions containing <string> (in the abbrev, in the mode, or in the expansion). The

argument is actually a TECO search string (See section 19.3 [TECO search strings], page 85.). If you want to see the abbrevs which contain either <string1> or <string2>, separate the strings with a ↑O; to see abbrev definitions containing either "defn" or "wab", do M-X List Word Abbrevs♦defn↑Owab<cr>.

You can provide M-X List Word Abbrevs with an argument to control whether the filtering string applies to just the abbrev (C-U 1), just the expansion (C-U 2), just the mode (C-U 4), or any combination (the sum). C-U 3 M-X List Word Abbrevs♦lisp<cr> will match "lisp" against abbrevs and expansions, but not modes.

M-X Insert Word Abbrevs♦<string><cr> works similarly, but inserts the list into the buffer instead of typing it out.

25.2.4. Dumped EMACS Environments

M-X Write Word Abbrev File♦<filename><cr>
: Writes a file of all abbrev definitions, before dumping.

M-X Read Word Abbrev File♦<filename><cr>
: Reads file of abbrev definitions at init-time.

M-X Write Incremental Word Abbrev File♦<filename><cr>
: Writes a file of abbrev definitions changed since dumping.

M-X Read Incremental Word Abbrev File♦<filename><cr>
: Reads file of changed abbrev definitions at startup-time.

Some users with highly customized EMACS environments (their init files take a long time to run) "dump out" their environments, in effect creating another EMACS-like program (the "dump") which starts up much faster. (For instance, 1.7 cpu seconds instead of 70.5 cpu seconds. See the file INFO:CONV.INFO, for more details about dumping environments.) Since the dumped environment contains word abbrev definitions, a dumped environment with hundreds of abbrevs can start just as quickly as if it had none. (But reading all these abbrevs with M-X Read Word Abbrev File in the init file originally took a long time.) For these users it is important, at dump-startup time, to read in only those abbrevs which were changed or defined *since* the environment was dumped out. A file which contains only these new abbrev's definitions is called an *incremental word abbrev file*. (It also can specify that certain abbrevs are to be killed if they were defined when the environment was dumped out, but subsequently killed.)

The startup for the dump should use the Read Incremental Word Abbrev File function instead of Read Word Abbrev File. It takes the filename as a string argument, which defaults to INCABS..0. The command M-X Write Incremental Word Abbrev File♦<filename><cr> writes such a file, writing out those abbrevs more recent than the dump (ones read by Read Incremental Word Abbrev File and ones defined in the current editing session).

Setting Save Word Abbrevs to -1 will cause an incremental abbrev file to be automatically written, if necessary, when EMACS is exited.

When you want to dump out a new EMACS, first create a new, complete word abbrev definition file using M-X Write Word Abbrev File. This file now has *all* abbrevs in it, and you can thus delete any incremental definition files you have. Then start up

the new EMACS from scratch, using the init file, and dump it. (The init file in general should call Read Word Abbrev File and then *also* call Read Incremental Word Abbrev File, just in case there are both kinds of files around. The startup calls only Read Incremental Word Abbrev File.) Note that these functions will return without error if their files don't exist, as a convenience.

25.3. Teco Details for Extension Writers

This section documents some details that users programming extensions may need to know, in order to interact properly with Word Abbrev mode operation or to build upon it.

The variable WORDAB Setup Hook, if non-0, is executed when the WORDAB library is loaded and sets itself up. (M-X Word Abbrev Mode<cr> in the default EMACS environment auto-loads the WORDAB library.) If there is no hook, the normal key connections (C-X C-A, C-X U, etc.) are made; if there is a hook, it must do the connections.

The variable Word Abbrevs Modified is non-0 when abbrev definitions have changed. This is used to signal the abbrev-saving mechanism.

The abbrev definers, such as C-X C-A (^R Add Mode Word Abbrev), check to see if the volatile TECO mark, fs^RMark♦, is set; if it is, then the region between point and fs^RMark♦ is used as the expansion. The intention is to provide a mechanism for simple but safe expansion marking. See section 22.5 [FS Flags], page 113.

Finally, the general way that Word Abbrev mode works is this: at certain times, when characters are likely to have been reconnected, a Word Abbrev mode subroutine looks at each of the expander characters to see if they are running an expander or have been reconnected. If they don't have expanders, they are connected to an expander function (which first checks for expansion and then calls the "old" function, what the character was connected to before). The problem is that it is not really possible to efficiently catch all the times that characters of interest are reconnected. So, as a good guess, Word Abbrev mode looks at these characters when the & Set Mode Line function is called. This happens when major or minor modes change, when buffer switching happens, and when Set Key is used. These are the standard times that connections are changed. However, the extension writer must be careful about reconnecting expander characters. If an extension might do this, it should do 1fsMode Change♦ to cause expansions to be redefined.

Chapter Twenty-Six

The PICTURE Subsystem, an Editor for Text Pictures

If you want to create a picture made out of text characters (for example, a picture of the division of a register into fields, as a comment in a program), the PICTURE package can make it easier.

Do M-X Load Lib◊PICTURE<cr>, and then M-X Edit Picture is available. Do M-X Edit Picture with point and mark surrounding the picture to be edited. Edit Picture enters a recursive editing level (which you exit with C-M-Z, as usual) in which certain commands are redefined to make picture editing more convenient.

While you are inside Edit Picture, all the lines of the picture are padded out to the margin with spaces. This makes two-dimensional motion very convenient; C-B and C-F move horizontally, and C-N and C-P move vertically without the inaccuracy of a ragged right margin. When you exit from Edit Picture, spaces at the ends of lines are removed. Nothing stops you from moving outside the bounds of the picture, but if you make any changes there slightly random things may happen.

Edit Picture makes alteration of the picture convenient by redefining the way printing characters and Rubout work. Printing characters are defined to replace (overwrite) rather than inserting themselves. Rubout is defined to undo a printing character: it replaces the previous character with a space, and moves back to it.

Return is defined to move to the beginning of the next line. This makes it usable for moving to the next apparently blank (but actually filled with nothing but spaces) line, just as you use Return normally with lines that are really empty. C-O creates new blank lines after point, but they are created full of spaces.

Tab is redefined to indent (by moving over spaces, not inserting them) to under the first non-space on the previous line. Linefeed is as usual equivalent to Return followed by Tab.

Four movement-control commands exist to aid in drawing vertical or horizontal lines: If you give the command M-X Up Picture Movement, each character you type thereafter will cause the cursor to move up instead of to the right. Thus if you want to draw a line of dashes up to some point, you can give the command Up Picture Movement, type enough dashes to make the line, and then give the command Right Picture Movement to put things back to normal. Similarly, there are functions to cause downward and leftward movement: Down Picture Movement and Left Picture Movement. These commands remain in effect only until you exit the Edit Picture function. (One final note: you can use these cursor movement commands outside of

Edit Picture too, even when not in Overwrite mode. You have to be somewhat careful though.)

Possible future extensions include alteration of the kill and un-kill commands to replace instead of deleting and inserting, and to handle rectangles if two corners are specified using point and the mark.

Chapter Twenty-Seven

Sorting Functions

The SORT library contains functions called Sort Lines, Sort Paragraphs and Sort Pages, to sort the region alphabetically line by line, paragraph by paragraph or page by page. For example, Sort Lines rearranges the lines in the region so that they are in alphabetical order.

Paragraphs are defined in the same way as for the paragraph-motion functions (See section 11.2 [Paragraphs], page 47.) and pages are defined as for the page motion commands (See section 18 [Pages], page 79.). All of these functions can be undone by the Undo command (See section 24.3 [Undo], page 128.). They take no arguments.

You can rearrange pages to any way you like using the functions Make Page Permutation Table and Permute Pages From Table. Make Page Permutation Table starts you editing a table containing the first line of each page. This table is kept in a buffer named *Permutation Table*. You specify the new ordering for the pages by rearranging the first lines into the desired order. You can also omit or duplicate pages by omitting or duplicating the lines.

When you are finished rearranging the lines, use Permute Pages From Table to rearrange the entire original file the same way. Reselect the original buffer first. The permuted version is constructed in a buffer named *Permuted File*. The original buffer is not changed. You can use Insert Buffer to copy the data into the original buffer.

Appendix I

Particular Types of Terminals

I.1. Ideal Keyboards

An ideal EMACS keyboard can be recognized because it has a Control key and a Meta key on each side, with another key labelled Top above them.

On an ideal keyboard, to type any character in the 9-bit character set, hold down Control or Meta as appropriate while typing the key for the rest of the character. To type C-M-K, type K while holding down Control and Meta.

The "bit prefix" characters that you must use on other terminals are also available on terminals with Meta keys, in case you find them more convenient or get into habits on those other terminals.

To type numeric arguments on these keyboards, type the digits or minus sign while holding down either Control or Meta.

I.2. Keyboards with an "Edit" key

Keyboards with Edit keys probably belong to Datamedia or Teleray terminals. The Edit and Control keys are a pair of shift keys. Use the Control key to type Control characters and the Edit key to type Meta characters. Thus, the 9-bit EMACS character C-M-Q is typed by striking the "Q" key while holding down "Edit" and "Control".

While the Edit key is a true independent bit which can be combined with anything else you can type, the Control key really means "ASCII control". Thus, the only Control characters you can type are those which exist in ASCII. This includes C-A, C-B, C-D through C-Z, C-], C-@, C-\, and C-^. C-C can be typed on the terminal but it is intercepted by the operating system and therefore unavailable as EMACS command. C-[is not available because its spot in ASCII is pre-empted by Altmode. The corresponding Control-Meta commands are also hard to type. If you can't type C-; directly, then you also can't type C-M-; directly.

Though you can't type C-; directly, you can use the bit prefix character C-^ and type C-^ ;. Similarly, while you can't type C-M-;, you can use the Control-Meta prefix C-Z and type C-Z ;. Because C-^ is itself awkward, we have designed the EMACS command set so that the hard-to-type Control (non-Meta) characters are rarely needed.

To type numeric arguments, it is best to type the digits or minus sign while holding down the Edit key.

I.3. ASCII Keyboards

An ASCII keyboard allows you to type in one keystroke only the command characters with equivalents in ASCII. No Meta characters are possible, and not all Control characters are possible either. The Control characters which you can type directly are C-A, C-B, C-D through C-Z, C-], C-@, C-\, and C-^. C-C can be typed on the terminal but it is intercepted by the operating system and therefore unavailable as EMACS command. C-[is not available because its spot in ASCII is pre-empted by Altmode.

Those characters which you can't type directly can be typed as two character sequences using the bit prefix characters Altmode, C-Z and C-^. Altmode turns on the Meta bit of the character that follows it. Thus, M-A can be typed as Altmode A, and C-M-A as Altmode C-A. Altmode can be used to get almost all of the characters that can't be typed directly. C-Z can be used to type any Control-Meta character, including a few that Altmode can't be used for because the corresponding non-Meta character isn't on the keyboard. Thus, while you can't type C-M-; as Altmode Control-;, since there is no Control-; in ASCII, you can type C-M-; as C-Z ;. The Control (non-Meta) characters which can't be typed directly require the use of C-^, as in C-^ < to get the effect of C-<. Because C-^ by itself is hard to type, the EMACS command set is arranged so that most of these non-ASCII Control characters are not very important. Usually they have synonyms which are easier to type. In fact, in this manual only the easier-to-type forms are usually mentioned.

On ASCII keyboards, you can type a numeric argument by typing an Altmode followed by the minus sign and/or digits. Then comes the command for which the argument is intended. For example, type Altmode 5 C-N to move down five lines. If the command is a Meta command, it must have an Altmode of its own, as in Altmode 5 Altmode F to move forward five words.

Note to customizers: this effect requires redefining the Meta-digit commands, since the Altmode and the first digit amount to a Meta-digit character. The new definition is ^R Autoarg, and the redefinition is done by the default init file.

If you use numeric arguments very often, and you dislike having to start one with an Altmode, you might enjoy using Autoarg mode, in which you can specify a numeric argument by just typing the digits. See section 4 [Arguments], page 17, for details.

I.4. Upper-case-only Terminals

On terminals lacking the ability to display or enter lower case characters, a special input and output case-flagging convention has been defined for editing files which contain lower case characters.

The customary escape convention is that a slash prefixes any upper case letter; all

unprefixed letters are lower case (but see below for the "lower case punctuation characters"). This convention is chosen because lower case is usually more frequent in files containing any lower case at all. Upper case letters are displayed with a slash ("/") in front. Typing a slash followed by a letter is a good way to insert an upper case letter. Typing a letter without a slash inserts a lower case letter. For the most part, the buffer will appear as if the slashes had simply been inserted (type /A and it inserts an upper case A, which displays as /A), but cursor-motion commands will reveal that the slash and the A are really just one character. Another way to insert an upper-case letter is to quote it with C-Q.

Note that this escape convention applies only to display of the buffer and insertion in the buffer. It does not apply to arguments of commands (it is hardly ever useful for them, since case is ignored in command names and most commands' arguments). Case conversion is performed when you type commands into the minibuffer, but not when the commands are actually executed.

The ASCII character set includes several punctuation characters whose codes fall in the lower case range and which cannot be typed or displayed on terminals that cannot handle lower case letters. These are the curly braces ("{" and "}"), the vertical bar ("|"), the tilde ("~"), and the accent grave ("`"). Their upper case equivalents are, respectively, the square brackets ("[" and "]"), the backslash ("\"), the caret ("^"), and the atsign ("@"). For these punctuation characters, EMACS uses the opposite convention of that used for letters: the ordinary, upper case punctuations display as and are entered as themselves, while the lower case forms are prefixed by slashes. This is because the "lower case" punctuations are much less frequently used. So, to insert an accent grave, type "/@".

When the slash escape convention is in effect, a slash is displayed and entered as two slashes.

This slash-escape convention is not normally in effect. To turn it on, the TECO command -1$ (minus one dollar sign, not Altmode!) must be executed. The easiest way to do this is to use the minibuffer: Altmode Altmode -1$ Altmode Altmode. To turn off the escape convention (for editing a file of all upper case), the command is 0$ (zero dollar sign), or Altmode Altmode 0$ Altmode Altmode. If you use such a bad terminal frequently, you can define yourself an EMACS extension, a command to turn slash-escape on and off.

The lower case editing feature is actually more flexible than described here. Refer to the TECO commands F$ and FS CASE♦, using M-X TECDOC, for full details. See section 22.5 [FS Flags], page 113.

1.5. The SLOWLY Package for Slow Terminals

The SLOWLY library is intended as an aid for people using display terminals at slow speeds. It provides means of limiting redisplay to smaller parts of the screen, and for turning off redisplay for a time while you edit.

To use SLOWLY, do M-X Load Library♦SLOWLY<cr>, and if your terminal is a display operating at 1200 baud or less (or if its speed is unknown) SLOWLY will set up the commands described here.

Comments, bugs, and suggestions to RWK@MIT-MC

I.5.1. Brief Description

SLOWLY provides an alternate version of the incremental searching commands on C-S and C-R, ^R Edit Quietly on C-X Q, a way to shrink the screen at either the top or the bottom on M-O, and more flexibility in where minibuffers get displayed. If SLOWLY is loaded, it redefines these commands only if the terminal speed is 1200 baud or less.

I.5.2. SLOWLY Commands

The commands provided are:

M-O (^R Set Screen Size)

This function reduces the amount of the screen used for displaying your text, down to a few lines at the top or the bottom. If called without an argument, it will use the same size as last time (or 3 if it hasn't been called before). If given a positive argument, that is taken to be the number of lines to use at the top of the screen. If given a negative argument, it is taken to be the number of lines at the bottom of the screen. If given an argument of 0, it returns to the use of the entire screen. The section of the screen that is in use is (defaultly) delimited by a line of 6 dashes. This command sets the variable Short Display Size.

C-S (^R Slow Display I-Search)

This function is just like the usual incremental search, except if the search would run off the screen and cause a redisplay, it narrows the screen to use only a few lines at the top or bottom of the screen to do the redisplay in. When the search is exited, use of the full screen resumes. The size of the window used for the search is the value of the variable Slow Search Lines. If it is positive, it is the number of lines at top of screen; if negative, it is the number of lines at bottom of screen. The default is 1. The variable Slow Search Separator contains the string used to show the end of the search window. By default it is six dashes. See section 10 [Search], page 43.

C-R (^R Slow Reverse Display I-Search)

This searches in backwards in the style of ^R Slow Display I-Search.

C-X Q (^R Edit Quietly)

This function enters a recursive editing level with redisplay inhibited. This means that your commands are carried out but the screen does not change. C-L with no argument redisplays. So you can update the screen when you want to. Two C-L's in a row clear the screen and redisplay. C-L with an argument repositions the window, as usual (See section 15 [C-L], page 71.). To exit and resume continuous redisplay, use C-M-Z.

I.5.3. Minibuffers

SLOWLY provides control over how minibuffers display on your screen. The variable Minibuffer Size specifies how many lines it takes up. If this is made negative, the minibuffer will appear at the bottom of the screen instead of the top. Thus one mode of operation which some people like is to use ^R Set Screen Size to set up to not use the bottom 3 lines of the screen, and set Minibuffer Size to -3. This will permanently reserve 3 lines at the bottom of the screen for the minibuffer. See section 23 [Minibuffer], page 123.

The variable Minibuffer Separator holds the string used to separate the minibuffer area from the rest of the screen. By default, this is six dashes.

SLOWLY installs its minibuffer by defining the variable MM & Minibuffer.

I.5.4. SLOWLY Options

The simplest way to run SLOWLY is to simply load it, and use the default key assignments, etc. SLOWLY sets up those key assignments only if your terminal is no faster than 1200 baud.

If you want SLOWLY to not set up these things unless your terminal is running at 300 baud or slower (ugh!), set the variable SLOWLY Maximum Speed to the highest speed at which SLOWLY is desired. Put the following in your EMACS init file:

```
300 M.VSLOWLY Maximum Speed♦
```

If you don't like the command assignments set up by SLOWLY, you can override them by defining the variable SLOWLY Setup Hook before loading SLOWLY. The value should be TECO commands to define the command assignments you wish.

SLOWLY normally uses lines of six dashes to separate areas of the screen. You can tell it to use something else instead. Minibuffers use the value of Minibuffer Separator, searches use the value of Slow Search Separator. If one of these is unspecified (the variable does not exist), the value of Default Separator is used. The separator for small screen mode is always the value of Default Separator. If the value specified is the null string, a blank line is used. If the value specified is zero, nothing (not even a blank line) is used. This is useful for searches, since you aren't going to be doing any editing in the search window.

Even though SLOWLY does not redefine the commands on a fast terminal, you might wish to load it only on slow terminals to save address space the rest of the time. This can be done in an init file with

```
fsospeed♦-1200:"g m(m.mLoad Library♦)SLOWLY♦'
```

Appendix II

Use of EMACS from Printing Terminals

While EMACS was designed to be used from a display terminal, you can use it effectively from a printing terminal. You cannot, however, learn EMACS using one.

All EMACS commands have the same editing effect from a printing terminal as they do from a display. All that is different is how they try to show what they have done. EMACS attempts to make the same commands that you would use on a display terminal act like an interactive line-editor. It does not do as good a job as editors designed originally for that purpose, but it succeeds well enough to keep you informed of what your commands are accomplishing, provided you know what they are supposed to do and know how they would look on a display.

The usual buffer display convention for EMACS on a printing terminal is that the part of the current line before the cursor is printed out, with the cursor following (at the right position in the line). What follows the cursor on the line is not immediately visible, but normally you will have a printout of the original contents of the line a little ways back up the paper. For example, if the current line contains the word "FOOBAR", and the cursor is after the "FOO", just "FOO" would appear on the paper, with the cursor following it. Typing the C-F command to move over the "B" would cause "B" to be printed, so that you would now see "FOOB" with the cursor following it. All forward-motion commands that move reasonably short distances print out what they move over.

Backward motion is handled in a complicated way. As you move back, the terminal backspaces to the correct place. When you stop moving back and do something else, a linefeed is printed first thing so that the printing done to reflect subsequent commands does not overwrite the text you moved back over and become garbled by it. The Rubout command acts like backward motion, but also prints a slash over the character rubbed out. Other backwards deletion commands act like backward motion; they do not print slashes (it would be an improvement if they did).

One command is different on a printing terminal: C-L, which normally means "clear the screen and redisplay". With no argument, it retypes the entire current line. An argument tells it to retype the specified number of lines around the current line.

Unfortunately, EMACS cannot perfectly attain its goal of making the text printed on the current line reflect the current line in the buffer, and keeping the horizontal position of the cursor correct. One reason is that it is necessary for complicated commands to echo, but echoing them screws up the "display". The only solution is to type a C-L whenever you have trouble following things in your mind. The need to keep a mental model of the text being edited is, of course, the fundamental defect of all printing terminal editors.

Note: it is possible to make a specific command print on a printing terminal in whatever way is desired, if that is worth while. For example, Linefeed knows explicitly how to display itself, since the general TECO redisplay mechanism isn't able to handle it. Suggestions for how individual commands can display themselves are welcome, as long as they are algorithmic rather than simply of the form "please do the right thing".

Glossary

Aborting — Aborting a recursive editing level (q.v.) means canceling the command which invoked the recursive editing. For example, if you abort editing a message to be sent, the message is not sent. Aborting is done with the command C-]. See section 24.1 [Aborting], page 125.

Altmode — Altmode is a character, labelled Escape on some keyboards. It is the bit prefix character (q.v.) used to enter Meta-characters when the keyboard does not have a Meta (q.v.) key. See section 2 [Characters], page 9. Also, it delimits string arguments to extended commands. See section 5 [Extended Commands], page 19.

Balance Parentheses — EMACS can balance parentheses manually or automatically. You can ask to move from one parenthesis to the matching one. See section 20.5.1 [Lists], page 93. When you insert a close parenthesis, EMACS can show the matching open. See section 20.3 [Matching], page 89.

Bit Prefix Character — A bit prefix character is a command which combines with the next character typed to make one character. They are used for effectively typing commands which the keyboard being used is not able to send. For example, to use a Meta-character when there is no Meta key on the keyboard, the bit prefix character Altmode (q.v.) is needed. See section 2 [Characters], page 9.

Buffer — The buffer is the basic editing unit; one buffer corresponds to one piece of text being edited. You can have several buffers, but at any time you are editing only one, the "selected" buffer, though two can be visible when you are using two windows. See section 14 [Buffers], page 67.

C- — C is an abbreviation for Control, in the name of a character. See section 2 [Characters], page 9.

C-M- — C-M- is an abbreviation for Control-Meta, in the name of a character. See section 2 [Characters], page 9.

Command — A command is a character or sequence of characters which, when typed by the user, fully specifies one action to be performed by EMACS. For example, "X" and "Control-F" and "Meta-X Text Mode<cr>" are commands. See section 2 [Characters], page 9. Sometimes the first character of a multi-character command is also considered a command: M-X Text Mode<cr> is a command (an extended command), and M-X is also a command (a command

to read a function name and invoke the function). See section 5 [Extended Commands], page 19.

Completion Completion is what EMACS does when it automatically fills out the beginning of an extended command name into the full name, or as much of it as can be deduced for certain. Completion occurs when Altmode, Space or Return is typed. See section 5 [Extended Commands], page 19.

Connected A character command in EMACS works by calling a function which it is "connected" to. Customization often involves connecting a character to a different function. See "Dispatch table". See section 2 [Characters], page 9.

Continuation Line When a line of text is longer than the width of the screen, it is displayed on more than one line of screen. We say that the line is continued, and that all screen lines used but the first are called continuation lines. See section 3 [Basic Editing], page 13.

Control Control is the name of a bit which each command character does or does not contain. A character's name includes the word Control if the Control bit is part of that character. Ideally, this means that the character is typed using the Control key: Control-A is typed by typing "A" while holding down Control. On most keyboards the Control key works in only some cases; the rest of the time, a bit prefix character (q.v.) must be used. See section 2 [Characters], page 9.

Control-Character A Control character is a character which includes the Control bit.

Control-X Command A Control-X command is a two-character command whose first character is the prefix character Control-X. See section 2 [Characters], page 9.

<cr> <cr> stands for the carriage return character, in contexts where the word "Return" might be confusing. See section 2 [Characters], page 9.

CRLF CRLF stands for the sequence of two characters, carriage return followed by linefeed, which is used to separate lines in files and in text being edited in EMACS. See section 2 [Characters], page 9.

Cursor The cursor is the object on the screen which indicates the position called point (q.v.) at which insertion and deletion takes place. The cursor is part of the terminal, and often blinks or underlines the character where it is located. See section 1 [Screen], page 5.

Customization Customization is making minor changes in the way EMACS works. It is often done by setting variables (See section 22.3 [Variables], page 109.) or by reconnecting commands (See section 5.2 [Functions], page 22.).

DEFUN A DEFUN is a list at the top level of list structure in a Lisp program. It is so named because most such lists are calls to the Lisp function DEFUN. See section 20.5.2 [DEFUNs], page 95.

Delete This is the label used on some keyboards for the Rubout character.

Deletion — Deletion means erasing text without saving it. EMACS deletes text only when it is expected not to be worth saving (all whitespace or only one character). The alternative is killing (q.v.). See section 9.1 [Killing], page 37.

Dispatch Table — The dispatch table is what records the connections (q.v.) from command characters to functions. Think of a telephone switchboard connecting incoming lines (commands) to telephones (functions). A standard EMACS has one set of connections; a customized EMACS may have different connections. See section 5.2 [Functions], page 22.

Echo Area — The echo area is the bottom three lines of the screen, used for echoing the arguments to commands, for asking questions, and printing brief messages. See section 1 [Screen], page 5

Echoing — Echoing is acknowledging the receipt of commands by displaying them (in the echo area). Most programs other than EMACS echo all their commands. EMACS never echoes single-character commands; longer commands echo only if you pause while typing them.

Escape — Escape is the label used on some keyboards for the Altmode character.

Exiting — Exiting EMACS means returning to EMACS's superior, normally EXEC. See section 6.3 [Exiting], page 27. Exiting a recursive editing level (q.v.) means allowing the command which invoked the recursive editing to complete normally. For example, if you are editing a message to be sent, and you exit, the message is sent.

Extended Command — An extended command is a command which consists of the character Meta-X followed by the command name (really, the name of a function (q.v.)). An extended command requires several characters of input, but its name is made up of English words, so it is easy to remember. See section 5 [Extended Commands], page 19.

Extension — Extension means making changes to EMACS which go beyond the bounds of mere customization. If customization is moving the furniture around in a room, extension is building new furniture. See the file INFO:CONV.INFO.

Filling — Filling text means moving text from line to line so that all the lines are approximately the same length. See section 11.4 [Filling], page 50.

Function — A function is a named subroutine of EMACS. When you type a command, EMACS executes a function which corresponds to the command, and the function does the work. Character commands are connected to functions through the dispatch table (q.v.). Extended commands contain the name of the function to be called; this allows you to call any function. See section 5 [Extended Commands], page 19.

Global — The global value of a variable or of a command character definition applies to all buffers and all files (except those which

have their own local values of the variable or definition). See section 22.3 [Variables], page 109.

Grinding — Grinding means reformatting a program so that it is indented according to its structure. See section 20.6 [Grinding], page 95.

Help — You can type the Help character at any time to ask what options you have, or to ask what any command does. See section 7 [Help], page 31.

Home Directory — Your home directory is the one on which your mail and your init files are stored. Twenex does not distinguish this from the working directory (connected directory).

INFO — INFO is the subsystem for perusing tree-structured documentation files. The documentation in INFO includes a version of the EMACS manual.

ITS — ITS is the Incompatible Timesharing System written at the MIT Artificial Intelligence Lab. EMACS was first developed on this system. Just what it is incompatible with has changed from year to year.

Kill Ring — The kill ring is where killed text is saved. It holds the last nine or so blocks of killed text. It is called a ring because you can bring any of the saved blocks to the front by rotating the ring. See section 9.2 [Un-Killing], page 39.

Killing — Killing means erasing text and saving it inside EMACS to be recovered later if desired. Most EMACS commands to erase text do killing, as opposed to deletion (q.v.). See section 9.1 [Killing], page 37.

List — A list is, approximately, a text string beginning with an open parenthesis and ending with the matching close parenthesis. See section 20.5.1 [Lists], page 93. Actually there are a few complications to the syntax, which is controlled by the syntax table (See section 22.4 [Syntax], page 111.).

Local — A local value of a variable or of a command character definition applies to only one buffer or file. See section 22.7 [Locals], page 118.

Local Modes List — A local modes list appears in a file to specify local values for variables or command character definitions, to be in effect while visiting that file.

M- — M- in the name of a character is an abbreviation for Meta.

M-X — M-X is the character which begins an extended command (q.v.). Extended commands have come to be known also as "M-X commands", and an individual extended command is often referred to as "M-X such-and-such". See section 5 [M-X], page 19.

Major Mode — The major modes are a mutually exclusive set of options which configure EMACS for editing a certain sort of text. Ideally, each programming language has its own major mode. See section 20.1 [Major Modes], page 87.

Mark — The mark points, invisibly, to a position in the text. Many commands operate on the text between point and the mark (known as the region, q.v.). See section 8 [Mark], page 33.

Meta — Meta refers to the Meta key. A character's name includes the word Meta if the Meta key must be held down in order to type the character. If there is no Meta key, then the Altmode character is used as a prefix instead. See section 2 [Characters], page 9.

Meta Character — A Meta character is one whose character code includes the Meta bit. These characters can be typed only by means of a Meta key or by means of the metizer command (q.v.).

Metizer — The metizer is another term for the bit prefix character for the Meta bit; namely, Altmode (q.v.).

Minibuffer — The minibuffer is a facility for editing and then executing a TECO program. See section 23 [Minibuffer], page 123.

Minor mode — A minor mode is an optional feature of EMACS which can be switched on or off independently of all other features. Each minor mode is both the name of an option (q.v.) and the name of an extended command to set the option. See section 22.1 [Minor Modes], page 107.

MM-command — This is an obsolete synonym for "extended command".

Mode line — The mode line is a line just above the echo area (q.v.), used for status information. See section 1.1 [Mode Line], page 6.

Narrowing — Narrowing means limiting editing to only a part of the text in the buffer. Text outside that part is inaccessible to the user until the boundaries are widened again, but it is still there, and saving the file saves it all. See section 17 [Narrowing], page 77.

Node — The node is the unit of structure of INFO (q.v.) files. When referring to documentation contained only in INFO files, we sometimes refer to a node of a specific name, in a specific file, as in "See the file INFO:CONV.INFO, node Hooks".

Numeric Argument — A numeric argument is a number specified before a command to change the effect of the command. Often the numeric argument serves as a repeat count. See section 4 [Numeric Arguments], page 17.

Option — An option is a variable which exists to be set by the user to change the behavior of EMACS commands. This is an important method of customization. See section 22.3 [Variables], page 109.

Parse — We say that EMACS parses words or expressions in the text being edited. Really, all it knows how to do is find the other end of a word or expression. See section 22.4 [Syntax], page 111.

Point — Point is the place in the buffer at which insertion and deletion occur. Point is considered to be between two characters, not at one character. The terminal's cursor (q.v.) indicates the location of point. See section 3 [Basic], page 13.

Prefix Character — A prefix character is a command whose sole function is to

introduce a set of multi-character commands. Control-X (q.v.) is a prefix character. The bit prefix characters (q.v.) are other examples.

Prompt A prompt is text printed in the echo area to ask the user for input. Printing a prompt is called "prompting". EMACS can prompt when a command requires an argument, or when only part of a command has been typed. However, the prompt will not appear unless you pause in your typing. See section 5 [Extended Commands], page 19.

Q-Registers Q-registers are internal TECO variables which can be used by EMACS or by the user to store text or numbers.

Quitting Quitting means interrupting a command which is partially typed in or already executing. It is done with Control-G. See section 24.1 [Quitting], page 125.

Quoting Quoting means depriving a character of its usual special significance. It is usually done with Control-Q. What constitutes special significance depends on the context and on convention. For example, an "ordinary" character as an EMACS command inserts itself; so you can insert any other character, such as Rubout, by quoting it as in Control-Q Rubout. Not all contexts allow quoting. See section 3 [Basic Editing], page 13.

Recursive Editing Level
A recursive editing level is a state in which part of the execution of a command involves asking the user to edit some text. This text may or may not be the same as the text to which the command was applied. The mode line indicates recursive editing levels with square brackets ("[" and "]"). See section 6.2 [Recursive Editing Level], page 26.

Redisplay Redisplay is the process of correcting the image on the screen to correspond to changes that have been made in the text being edited. See section 1 [Screen], page 5.

Region The region is the text between point (q.v.) and the mark (q.v.). The terminal's cursor indicates the location of point, but the mark is invisible. Many commands operate on the text of the region. See section 9 [Mark], page 33.

Return Return is the carriage return character, used as input to EMACS. Return is used as a command in itself to insert a line separator. It also terminates arguments for most commands. See section 2 [Characters], page 9.

Rubout Rubout is a character, sometimes labelled "Delete". It is used as a command to delete one character of text. It also deletes one character when an EMACS command is reading an argument.

S-expression An s-expression is the basic syntactic unit of Lisp: either a list, or a symbol containing no parentheses (actually, there are a few exceptions to the rule, based on the syntax of Lisp). See section 20.5.1 [Lists], page 93.

Selecting Selecting a buffer (q.v.) means making editing commands apply to

that buffer as opposed to any other. At all times one buffer is selcted and editing takes place in that buffer. See section 14 [Buffers], page 67.

Self-documentation
: Self-documentation is the feature of EMACS which can tell you what any command does, or give you a list of all commands related to a topic you specify. You ask for self-documentation with the Help character. See section 7 [Help], page 31.

String Argument
: A string argument is an argument which follows the command name in an extended command. In "M-X Apropos♦word<cr>", "Word" is a string argument to the Apropos command. See section 5 [Extended Commands], page 19.

Subsystem
: A subsystem of EMACS is an EMACS command which, itself, reads commands and displays the results. Examples are INFO, which is for perusing documentation; DIRED, which is for editing directories; BABYL, which is for reading and editing mail. The word "subsystem" implies that it offers many independent commands which can be used freely. If an EMACS function asks specific questions, we do not call it a subsystem.

  Usually the subsystem continues in operation until a specific command to exit (usually "Q") is typed. The commands for a subsystem do not usually resemble ordinary EMACS commands, since editing text is not their purpose. The Help character should elicit the subsystem's documentation. See section 6.1 [Subsystems], page 25.

Syntax Table
: The syntax table tells EMACS which characters are part of a word, which characters balance each other like parentheses, etc. See section 22.4 [Syntax], page 111.

Tailoring
: This is a synonym for customization (q.v.).

TECO Search String
: A TECO search string is a sort of pattern used by the TECO search command, and also by various EMACS commands which use the TECO search command. See section 19.3 [TECO search strings], page 85.

Top Level
: Top level is the normal state of EMACS, in which you are editing the text of the file you have visited. You are at top level whenever you are not in a recursive editing level or a subsystem (q.v.).

Twenex
: Twenex is the operating system which DEC likes to call "TOPS-20". However, a person should not be forced to call a system "tops" unless he really thinks so. Come now, DEC, don't you think people will praise your products voluntarily? The name "Twenex" is also more appropriate because Twenex was developed from the Tenex system, and has no relationship to "TOPS-10". What's more, it's very euphonious.

Typeout
: Typeout is a message, printed by an EMACS command, which overwrites the area normally used for displaying the text being edited, but which does not become part of the text. Typeout is used for messages which might be too long to fit in the echo area (q.v.). See section 1 [Screen], page 5.

Undo Undo is a command which undoes the effect on the buffer of a previous command. Only some commands are undoable and only the most recent undoable command can be undone. See section 24.3 [Undo], page 128.

Un-killing Un-killing means reinserting text previously killed. It can be used to undo a mistaken kill, or for copying or moving text. See section 9.2 [Un-killing], page 39.

User Name Your user name is the name you use to log in. It identifies you as opposed to all the other users. It may be the same as your home directory's name.

Variable A variable is a name with which EMACS associates a value, which can be a number or a string. See section 22.3 [Variables], page 109. Some variables ("options") are intended to be used or set by the user; others are for purely internal purposes.

Virtual Boundaries The virtual boundaries delimit the accessible part of the buffer, when narrowing (q.v.) is in effect. See section 17 [Narrowing], page 77.

Visiting Visiting a file means loading its contents into a buffer (q.v.) where they can be edited. See section 13.1 [Visiting], page 57.

Wall Chart The wall chart is a very brief EMACS reference sheet giving one line of information about each short command. A copy of the wall chart appears in this manual.

Whitespace Whitespace is any run of consecutive formatting characters (space, tab, carriage return, linefeed, and backspace).

Widening Widening is the operation which undoes narrowing (q.v.). See section 17 [Narrowing], page 77.

Window A window is a region of the screen in which text being edited is displayed. EMACS can divide the screen into two windows. See section 16 [Windows], page 73. "The window" also means the position in the buffer which is at the top of the screen. See section 15 [Display], page 71.

Working Directory This is another term for the directory you are connected to, a term which is used on other systems besides Twenex.

^R The string "^R" is the beginning of many function names. See section 5.2 [Functions], page 22.

^R Mode ^R mode is the real time editing mode of TECO. EMACS *always* operates in this mode.

Command Index

This index contains brief descriptions with cross references for all commands, grouped by topic. Within each topic, they are in alphabetical order. Our version of alphabetical order places non-control non-meta characters first, then control characters, then meta characters, then control-meta characters. Control-X and Meta-X commands come last.

Prefix Characters

Altmode (^R Prefix Meta)
Altmode is a bit prefix character which turns on the Meta bit in the next character. Thus, Altmode F is equivalent to the single character Meta-F, which is useful if your keyboard has no Meta key. See section 2 [Characters], page 9.

Control-^ (^R Prefix Control)
Control-^ is a bit prefix character which turns on the Control bit in the following character. Thus, Control-^ < is equivalent to the single character Control-<. See section 2 [Characters], page 9.

Control-Z (^R Prefix Control-Meta)
Control-Z is a bit prefix character which turns on the Control bit and the Meta bit in the following character. Thus, Control-Z ; is equivalent to the single character Control-Meta-;. See section 2 [Characters], page 9.

Control-Q (^R Quoted Insert)
Control-Q inserts the following character. This is a way of inserting control characters. See section 3 [Basic Editing], page 13.

Control-U (^R Universal Argument)
Control-U is a prefix for numeric arguments which works the same on all terminals. See section 4 [Arguments], page 17.

Control-X
Control-X is a prefix character which begins a two-character command. Each combination of Control-X and another character is a "Control-X command". Individual Control-X commands appear in this index according to their uses.

Meta-X (^R Extended Command)
Meta-X is a prefix character which introduces an extended command name. See section 5 [Meta-X], page 19.

Control-Meta-X (^R Instant Extended Command)

Control-Meta-X is another way of invoking an extended command. Instead of putting the arguments in the same line as the command name, the command reads the arguments itself. See section 5 [Meta-X], page 19.

Control-digits, Meta-digits, Control Meta-digits
: These all specify a numeric argument for the next command. See section 4 [Arguments], page 17.

Control-Minus, Meta-Minus, Control-Meta-Minus
: These all begin a negative numeric argument for the next command. See section 4 [Arguments], page 17.

Simple Cursor Motion

Control-A (^R Beginning of Line, built-in function)
: Control-A moves to the beginning of the line. See section 3 [Basic Editing], page 13.

Control-B (^R Backward Character, built-in function)
: Control-B moves backward one character. See section 3 [Basic Editing], page 13.

Control-E (^R End of Line, built-in function)
: Control-E moves to the end of the line. See section 3 [Basic Editing], page 13.

Control-F (^R Forward Character, built-in function)
: Control-F moves forward one character. See section 3 [Basic Editing], page 13.

Control-H (^R Backward Character, built-in function)
: Control-H moves backward one character. See section 3 [Basic Editing], page 13.

Control-N (^R Down Real Line)
: Control-N moves vertically straight down. See section 3 [Basic Editing], page 13.

Control-P (^R Up Real Line)
: Control-P moves vertically straight up. See section 3 [Basic Editing], page 13.

Control-R (^R Reverse Search)
: Control-R is like Control-S but searches backward. See section 10 [Search], page 43.

Control-S (^R Incremental Search)
: Control-S searches for a string, terminated by Altmode. It searches as you type. See section 10 [Search], page 43.

Meta-< (^R Goto Beginning)
: Meta-< moves to the beginning of the buffer. See section 3 [Basic Editing], page 13.

Meta-> (^R Goto End)
: Meta-> moves to the end of the buffer. See section 3 [Basic Editing], page 13.

Control-X Control-N (^R Set Goal Column)
: Control-X Control-N sets a horizontal goal for the Control-N and Control-P commands. When there is a goal, those commands try to move to the goal column instead of straight up or down.

Lines

Return (^R CRLF)
: Return inserts a line separator, or advances onto a following blank line. See section 3 [Basic Editing], page 13.

Control-O (^R Open Line, built-in function)
: Control-O inserts a line separator, but point stays before it. See section 3 [Basic Editing], page 13.

Control-X Control-O (^R Delete Blank Lines)
: Control-X Control-O deletes all but one of the blank lines around point. If the current line is not blank, all blank lines following it are deleted. See section 3 [Basic Editing], page 13.

Control-X Control-T (^R Transpose Lines)
: Control-X Control-T transposes the contents of two lines. See section 12 [Fixing Typos], page 55.

Killing and Un-killing

Rubout (^R Backward Delete Character, built-in function)
: Rubout deletes the previous character. See section 3 [Basic Editing], page 13.

Control-Rubout (^R Backward Delete Hacking Tabs, built-in function)
: Control-Rubout deletes the previous character, but converts a tab character into several spaces. See section 20.5 [Lisp], page 92.

Control-D (^R Delete Character, built-in function)
: Control-D deletes the next character. See section 3 [Basic Editing], page 13.

Control-K (^R Kill Line)
: Control-K kills to the end of the line, or, at the end of a line, kills the line separator. See section 9.1 [Killing], page 37.

Control-W (^R Kill Region)
: Control-W kills the region, the text betwen point and the mark. See section 9.1 [Killing], page 37. See section 8 [Region], page 33.

Control-Y (^R Un-kill)
: Control-Y reinserts the last saved block of killed text. See section 9.2 [Un-Killing], page 39.

Meta-W (^R Copy Region)
: Meta-W saves the region as if it were killed without removing it from the buffer. See section 9.2 [Un-Killing], page 39.

Meta-Y (^R Un-kill Pop)
: Meta-Y rolls the kill ring to reinsert saved killed text older than the most recent kill. See section 9.2 [Un-Killing], page 39.

Control-Meta-W (^R Append Next Kill)
: Control-Meta-W causes an immediately following kill command to append its text to the last saved block of killed text. See section 9.2 [Un-Killing], page 39.

Control-X T (^R Transpose Regions)
: Control-X T transposes two arbitrary regions defined by point and the last three marks. See section 12 [Fixing Typos], page 55.

M-X Overwrite Mode
: M-X Overwrite Mode turns Overwrite mode on or off. In Overwrite mode, printing characters overwrite existing text instead of pushing it to the right. See section 22.1 [Minor Modes], page 107.

Scrolling and Display Control

Control-L (^R New Window)
: Control-L clears the screen and centers point in it. With an argument, it can put point on a specific line of the screen. See section 15 [Display], page 71.

Control-V (^R Next Screen)
: Control-V scrolls the text upward by a screenful or several lines. See section 15 [Display], page 71.

Meta-R (^R Move to Screen Edge)
: Meta-R moves point to beginning of the text on a specified line of the screen. See section 15 [Display], page 71.

Meta-V (^R Previous Screen)
: Meta-V scrolls downward by a screenful or several lines. See section 15 [Display], page 71.

Control-Meta-R (^R Reposition Window)
: Control-Meta-R tries to center on the screen the function or paragraph you are looking at. See section 15 [Display], page 71.

Control-Meta-V (^R Scroll Other Window)
: Control-Meta-V scrolls the other window up or down, when you are in two window mode. See section 16 [Windows], page 73.

M-X View Buffer
: M-X View Buffer skips through a buffer by screenfuls. See section 15 [Display], page 71.

M-X View File
: M-X View File lets you move through a file sequentially by screenfuls forward and back. See section 13.7 [View File], page 64.

The Mark and the Region

Control-< (^R Mark Beginning)
: Control-< sets the mark at the beginning of the buffer. See section 8 [Mark], page 33.

Control-> (^R Mark End)
: Control-> sets the mark at the end of the buffer. See section 8 [Mark], page 33.

Control-@ (^R Set/Pop Mark)
: Control-@ sets the mark or moves to the location of the mark. See section 8 [Mark], page 33.

Meta-@ (^R Mark Word)
: Meta-@ puts the mark at the end of the next word. See section 11.1 [Words], page 45.

Meta-H (^R Mark Paragraph)
: Meta-H puts point at the beginning of the paragraph and the mark at the end. See section 11.2 [Sentences], page 47.

Control-Meta-@ (^R Mark Sexp)
: Control-Meta-@ puts the mark at the end of the next s-expression. See section 20.5.1 [Lists], page 93.

Control-Meta-H (^R Mark DEFUN)
: Control-Meta-H puts point at the beginning of the current DEFUN and the mark at the end. See section 20.5.2 [DEFUNs], page 95.

Control-X H (^R Mark Whole Buffer)
: Control-X H puts point at the beginning of the buffer and the mark at the end. See section 8 [Mark], page 33.

Control-X Control-P (^R Mark Page)
: Control-X Control-P puts point at the beginning of the current page and the mark at the end. See section 18 [Pages], page 79.

Control-X Control-X (^R Exchange Point and Mark)
: Control-X Control-X sets point where the mark was and the mark where point was. See section 8 [Mark], page 33.

Whitespace and Indentation

Tab (^R Indent According to Mode)
: Tab either adjusts the indentation of the current line or inserts some indentation, in a way that depends on the major mode. See section 20.2 [Indenting Programs], page 88. See section 11.3 [Indenting Text], page 48.

Linefeed (^R Indent New Line)
: Linefeed is equivalent to Return followed by Tab. It moves to a new line and indents that line. If done in the middle of a line, it breaks the line and indents the new second line. See section 11.3 [Indenting Text], page 48.

Meta-Tab (^R Tab to Tab Stop)
: Meta-Tab indents to the next EMACS-defined tab stop. See section 11.3 [Indenting Text], page 48.

Meta-M (^R Back to Indentation)
: Meta-M positions the cursor on the current line after any indentation. See section 11.3 [Indenting Text], page 48.

Meta-\ (^R Delete Horizontal Space)
: Meta-\ deletes all spaces and tab characters around point. See section 11.3 [Indenting Text], page 48.

Meta-^ (^R Delete Indentation)
: Meta-^ joins two lines, replacing the indentation of the second line with zero or one space, according to the context. See section 11.3 [Indenting Text], page 48.

Control-Meta-O (^R Split Line)
: Control-Meta-O breaks a line, preserving the horizontal position of the second half by indenting it to its old starting position. See section 11.3 [Indenting Text], page 48.

Control-Meta-\ (^R Indent Region)
: Control-Meta-\ indents each line in the region, either by applying Tab to each line, or by giving each the same specified amount of indentation. See section 11.3 [Indenting Text], page 48.

Control-X Tab (^R Indent Rigidly)
: Control-X Tab shifts all the lines in the region right or left the same number of columns. See section 11.3 [Indenting Text], page 48.

M-X Edit Indented Text
: M-X Edit Indented Text enters a recursive editing level designed for editing text in which each line is indented. See section 11.4 [Filling], page 50.

M-X Edit Tab Stops
: M-X Edit Tab Stops lets you edit the tab stops used by ^R Tab to Tab Stop. See section 11.3 [Indenting Text], page 48.

M-X Edit Tabular Text
: M-X Edit Tabular Text enters a recursive editing level designed for editing text arranged in a table. See section 11.4 [Filling], page 50.

M-X Indent Tabs Mode
: M-X Indent Tabs Mode turns Indent Tabs mode on or off. When Indent Tabs mode is on, the indentation commands use tab characters for indentation whenever possible. Otherwise they use only spaces. See section 22.1 [Minor Modes], page 107.

M-X Tabify
: M-X Tabify converts spaces after point to tabs when that can be done without changing the appearance. See section 11.3 [Indenting Text], page 48.

M-X Untabify
: M-X Untabify converts all tabs after point to spaces. A numeric argument says how far apart the tab stops are, which is good for converting files brought from systems with tab stops at intervals other than 8. See section 11.3 [Indenting Text], page 48.

Words, Sentences and Paragraphs

Control-X Rubout (^R Backward Kill Sentence)
: Control-X Rubout kills back to the beginning of the sentence. See section 11.2 [Sentences] page 47.

Meta-A (^R Backward Sentence)
: Meta-A moves to the beginning of the sentence. See section 11.2 [Sentences], page 47.

Meta-B (^R Backward Word)
: Meta-B moves backward one word. See section 11.1 [Words], page 45.

Meta-D (^R Kill Word)
: Meta-D kills one word forward. See section 11.1 [Words], page 45.

Meta-E (^R Forward Sentence)
: Meta-E moves to the end of the sentence. See section 11.2 [Sentences], page 47.

Meta-F (^R Forward Word)
: Meta-F moves forward one word. See section 11.1 [Words], page 45.

Meta-H (^R Mark Paragraph)
: Meta-H puts point at the front of the current paragraph and the mark at the end. See section 11.2 [Sentences], page 47.

Meta-K (^R Kill Sentence)
: Meta-K kills to the end of the sentence. See section 11.2 [Sentences], page 47.

Meta-T (^R Transpose Words)
: Meta-T transposes two consecutive words. See section 11.1 [Words], page 45.

Meta-[(^R Backward Paragraph)
: Meta-[moves to the beginning of the paragraph. See section 11.2 [Sentences], page 47.

Meta-] (^R Forward Paragraph)
: Meta-] moves to the end of the paragraph. See section 11.2 [Sentences], page 47.

Meta-Rubout (^R Backward Kill Word)
: Meta-Rubout kills the previous word. See section 11.1 [Words], page 45.

M-X Atom Word Mode
: M-X Atom Word Mode turns Atom Word mode on or off. In Atom Word mode, the word commands consider an entire Lisp atom as one word. See section 22.1 [Minor Modes], page 107.

M-X Edit Syntax Table
: M-X Edit Syntax Table allows you to edit the syntax table for word and list delimiters. See section 22.4 [Syntax Table], page 111.

Filling Text

Meta-G (^R Fill Region)
: Meta-G fills the region, treating it (usually) as one paragraph. See section 11.4 [Filling], page 50.

Meta-Q (^R Fill Paragraph)
: Meta-Q fills the current or next paragraph. See section 11.4 [Filling], page 50.

Meta-S (^R Center Line)
: Meta-S centers the current line. See section 11.4 [Filling], page 50.

Control-X . (^R Set Fill Prefix)
: Control-X . specifies the fill prefix, which is used for filling indented text. See section 11.4 [Filling], page 50.

Control-X F (^R Set Fill Column)
: Control-X F sets the variable Fill Column which controls the margin for filling and centering. See section 11.4 [Filling], page 50.

M-X Auto Fill Mode
: M-X Auto Fill Mode turns Auto Fill mode on or off. In Auto Fill mode, long lines are broken between words automatically. See section 11.4 [Filling], page 50.

Exiting

Control-] (Abort Recursive Edit)
: Control-] aborts a recursive editing level; that is to say, exits it without allowing the command which invoked it to finish. See section 24.1 [Quitting], page 125.

Control-Meta-Z (^R Exit, built-in function)
: Control-Meta-Z exits from a recursive editing level and allows the command which invoked the recursive editing level to finish. At top level, it exits from EMACS to its superior fork. See section 6.3 [Exiting], page 27.

Control-X Control-Z (^R Return to Superior)
: Control-X Control-Z returns from EMACS to its superior fork, even if EMACS is currently inside a recursive editing level. In that case, re-entering EMACS will find it still within the recursive editing level. See section 6.3 [Exiting], page 27.

M-X Compile
: M-X Compile exits from EMACS and repeats the most recent COMPILE-class command in the EXEC. See section 20 [Programs], page 87.

M-X Top Level
: M-X Top Level returns to the top level EMACS command loop or to TECO. See section 24.1 [Quitting], page 125.

Pages

Control-X L (^R Count Lines Page)
: Control-X L prints the number of lines on the current page, and how many come before point and how many come after. See section 18 [Pages], page 79.

Control-X P (^R Set Bounds Page)
: Control-X P narrows the virtual boundaries to the current page. See section 17 [Narrowing], page 77.

Control-X [(^R Previous Page)
: Control-X [moves backward to the previous page boundary. See section 18 [Pages], page 79.

Control-X] (^R Next Page)
: Control-X] moves forward to the next page boundary. See section 18 [Pages], page 79.

Control-X Control-P (^R Mark Page)
: Control-X Control-P puts point at the beginning and the mark at the end of the current page. See section 18 [Pages], page 79.

M-X View Page Directory (in PAGE)
: M-X View Page Directory prints a directory of the pages of the file. See section 18.1 [PAGE], page 80.

M-X What Page
: M-X What Page prints the current page and line number in the file. See section 18 [Pages], page 79.

Lisp

Meta-((^R Make ())
: Meta-(places a pair of parentheses around the next several s-expressions. See section 20.5.1 [Lists], page 93.

Meta-) (^R Move Over))
: Meta-) moves past the next close parenthesis and adjusts the indentation of the following line. See section 20.5.1 [Lists], page 93.

Control-Meta-Tab (^R Indent for Lisp)
: Control-Meta-Tab adjusts the indentation of the current line for proper Lisp style. See section 20.2 [Indenting], page 88.

Control-Meta-((^R Backward Up List)
: Control-Meta-(moves backward up one level of list structure. See section 20.5.1 [Lists], page 93.

Control-Meta-) (^R Up List)
: Control-Meta-) moves forward up one level of list structure. See section 20.5.1 [Lists], page 93.

Control-Meta-@ (^R Mark Sexp)

Control-Meta-@ puts the mark at the end of the next s-expression. See section 8 [Mark], page 33.

Control-Meta-A (^R Beginning of DEFUN)
Control-Meta-A moves to the beginning of the current DEFUN. See section 20.5.2 [DEFUNs], page 95.

Control-Meta-B (^R Backward Sexp)
Control-Meta-B moves backward over one s-expression. See section 20.5.1 [Lists], page 93.

Control-Meta-D (^R Down List)
Control-Meta-D moves forward and down a level in list structure. See section 20.5.1 [Lists], page 93.

Control-Meta-E (^R End of DEFUN)
Control-Meta-E moves to the end of the current DEFUN. See section 20.5.2 [DEFUNs], page 95.

Control-Meta-F (^R Forward Sexp)
Control-Meta-F moves forward over one s-expression. See section 20.5.1 [Lists], page 93.

Comtrol-Meta-G (^R Format Code)
Control-Meta-G grinds the s-expression after point. See section 20.6 [Grinding], page 95.

Control-Meta-H (^R Mark DEFUN)
Control-Meta-H puts point before and the mark after the current or next DEFUN. See section 20.5.2 [DEFUNs], page 95.

Control-Meta-K (^R Kill Sexp)
Control-Meta-K kills the following s-expression. See section 20.5.1 [Lists], page 93.

Control-Meta-N (^R Next List)
Control-Meta-N moves forward over one list, ignoring atoms before the first open parenthesis. See section 20.5.1 [Lists], page 93.

Control-Meta-P (^R Previous List)
Control-Meta-P moves backward over one list, ignoring atoms reached before the first close parenthesis. See section 20.5.1 [Lists], page 93.

Control-Meta-Q (^R Indent Sexp)
Control-Meta-Q adjusts the indentation of each of the lines in the following s-expression, but not the current line. See section 20.2 [Indenting], page 88.

Control-Meta-T (^R Transpose Sexps)
Control-Meta-T transposes two consecutive s-expressions. See section 20.5.1 [Lists], page 93.

(^R Backward Up List)
Control-Meta-U moves backward up one level of list structure. See section 20.5.1 [Lists], page 93.

Files

Meta-. (^R Find Tag)
Meta-. moves to the definition of a specific function, switching files if necessary. See section 21 [TAGS], page 99.

Meta-~ (^R Buffer Not Modified)
Meta-~ clears the flag which says that the buffer contains changes that have not been saved. See section 13.1 [Visiting], page 57.

Control-X Control-F (Find File)
Control-X Control-F visits a file in its own buffer. See section 14 [Buffers], page 67.

Control-X Control-Q (^R Do Not Write File)
Control-X Control-Q tells EMACS not to offer to save this file. See section 13.1 [Visiting], page 57.

Control-X Control-R (^R Read File)
Control-X Control-R visits a file and tells EMACS not to offer to save it. See section 13.1 [Visiting], page 57.

Control-X Control-S (^R Save File)
Control-X Control-S saves the visited file. See section 13.1 [Visiting], page 57.

Control-X Control-V (^R Visit File)
Control-X Control-V visits a file. See section 13.1 [Visiting], page 57.

Control-X Control-W (Write File)
Control-X Control-W saves the file, asking for names to save it under. See section 13.7 [Advanced File Commands], page 64.

M-X Append to File
M-X Append to File appends the contents of the region to the end of a specified file. See section 13.7 [Advanced File Commands], page 64.

M-X Auto Save Mode
M-X Auto Save Mode turns Auto Save mode on or off. See section 13.3 [Auto Save], page 59.

M-X Copy File
M-X Copy File copies a file to a new name. See section 13.7 [Advanced File Commands], page 64.

M-X Delete File
M-X Delete File deletes a file. See section 13.7 [Advanced File Commands], page 64.

M-X Insert File
M-X Insert File inserts the contents of a file into the buffer (within the existing text). See section 13.7 [Advanced File Commands], page 64.

M-X Prepend to File

M-X Prepend to File appends the contents of the region to the start of a specified file See section 13.7 [Advanced File Commands], page 64.

M-X Rename File

M-X Rename File changes the name of a file. See section 13.7 [Advanced File Commands], page 64.

M-X Revert File

M-X Revert File undoes changes to a file by reading in the previous version. See section 13.2 [Revert File], page 59.

M-X Save All Files

M-X Save All Files offers to write back buffers which may need it. See section 14 [Buffers], page 67.

M-X Set Visited Filename

M-X Set Visited Filename changes the visited filename, without writing a file. See section 13.7 [Advanced File Commands], page 64.

M-X Write Region

M-X Write Region writes the contents of the region into a file. See section 13.7 [Advanced File Commands], page 64.

File Directories

Control-X D (^R DIRED)

Control-X D invokes the directory editor DIRED, useful for deleting many files. See section 13.6 [DIRED], page 62.

Control-X Control-D (^R Directory Display)

Control-X Control-D displays a subset of a directory. See section 13.4 [Directories], page 61.

M-X Clean Directory

M-X Clean Directory deletes all but the most recent versions of every file in a directory. See section 13.5 [Cleaning Directories], page 61.

M-X List Files

M-X List Files prints a very brief listing of a directory, listing only the filenames, several files per line. See section 13.4 [Directories], page 61.

M-X Reap File

M-X Reap File deletes all but the most recent versions of a file. See section 13.5 [Cleaning Directories], page 61.

M-X View Directory

M-X View Directory prints a file directory. See section 13.4 [Directories], page 61.

Buffers

Control-X A (^R Append to Buffer)
: Control-X A adds the text of region into another buffer. See section 9.3 [Copying], page 41.

Control-X B (Select Buffer)
: Control-X B is the command for switching to another buffer. See section 14 [Buffers], page 67.

Control-X K (Kill Buffer)
: Control-X K kills a buffer. See section 14 [Buffers], page 67.

M-X Insert Buffer
: M-X Insert Buffer inserts the contents of another buffer into the existing text of this buffer. See section 14 [Buffers], page 67.

M-X Kill Some Buffers
: M-X Kill Some Buffers offers to kill each buffer. See section 14 [Buffers], page 67.

M-X Rename Buffer
: M-X Rename Buffer changes the name of the current buffer. See section 14 [Buffers], page 67.

Comments

Meta-Linefeed (^R Indent New Comment Line)
: Meta-Linefeed moves to a new line and indents it. If point had been within a comment on the old line, a new comment is started on the new line and indented under the old one. See section 20.4 [Comments], page 90.

Meta-; (^R Indent for Comment)
: Meta-; inserts a properly indented comment at the end of the current line, or adjusts the indentation of an existing comment. See section 20.4 [Comments], page 90.

Meta-N (^R Down Comment Line)
: Meta-N moves down a line and starts a comment. See section 20.4 [Comments], page 90.

Meta-P (^R Up Comment Line)
: Meta-P moves down a line and starts a comment. See section 20.4 [Comments], page 90.

Control-Meta-; (^R Kill Comment)
: Control-Meta-; kills any comment on the current line. See section 20.4 [Comments], page 90.

Control-X ; (^R Set Comment Column)
: Control-X ; sets the column at which comments are indented, from an argument, the current column, or the previous comment. See section 20.4 [Comments], page 90.

Case Conversion

Meta-C (^R Uppercase Initial)
: Meta-C makes the next word lower case with a capital initial. It moves over the word. See section 11.5 [Case], page 51.

Meta-L (^R Lowercase Word)
: Meta-L moves over a word converting it to lower case. See section 11.5 [Case], page 51.

Meta-U (^R Uppercase Word)
: Meta-U moves over a word converting it to upper case. See section 11.5 [Case], page 51.

Control-X Control-L (^R Lowercase Region)
: Control-X Control-L converts the text of the region to lower case. See section 11.5 [Case], page 51.

Control-X Control-U (^R Uppercase Region)
: Control-X Control-U converts the text of the region to upper case. See section 11.5 [Case], page 51.

Windows

Control-Meta-V (^R Scroll Other Window)
: Control-Meta-V scrolls the other window up or down. See section 15 [Display], page 71.

Control-X 1 (^R One Window)
: Control-X 1 returns to one-window mode. See section 16 [Windows], page 73.

Control-X 2 (^R Two Windows)
: Control-X 2 splits the screen into two windows. See section 16 [Windows], page 73.

Control-X 3 (^R View Two Windows)
: Control-X 3 splits the screen into two windows but stays in window one. See section 16 [Windows], page 73.

Control-X 4 (^R Visit in Other Window)
: Control-X 4 displays two windows and selects a buffer or visits a file in the other window. See section 16 [Windows], page 73.

Control-X O (^R Other Window)
: Control-X O switches from one window to the other. See section 16 [Windows], page 73.

Control-X ^ (^R Grow Window)
: Control-X ^ changes the allocation of screen space to the two windows. See section 16 [Windows], page 73.

Narrowing

Control-X N (^R Set Bounds Region)
: Control-X N narrows the virtual boundaries to the region. See section 17 [Narrowing], page 77.

Control-X P (^R Set Bounds Page)
: Control-X P narrows the virtual boundaries to the current page. See section 18 [Pages], page 79.

Control-X W (^R Set Bounds Full)
: Control-X W widens the virtual boundaries back to the entire buffer. See section 17 [Narrowing], page 77.

Status Information

Control-X = (What Cursor Position)
: Control-X = prints information on the screen position and character position of the cursor, the size of the file, and the character after the cursor. See section 11.4 [Filling], page 50.

Control-X L (^R Count Lines Page)
: Control-X L prints the number of lines in the current page, and how many come before or after point. See section 18 [Pages], page 79.

M-X List Loaded Libraries
: M-X List Loaded Libraries lists the names of all loaded libraries. See section 22.2 [Libraries], page 108.

M-X List Variables
: M-X List Variables lists the names and values of all variables, or of those whose names contain a specified string. See section 22.3 [Variables], page 109.

Keyboard Macros

Control-X ((^R Start Kbd Macro)
: Control-X (begins defining a keyboard macro. See section 22.8 [KBDMAC], page 119.

Control-X) (^R End Kbd Macro)
: Control-X) terminates the definition of a keyboard macro. See section 22.8 [KBDMAC], page 119.

Control-X E (^R Call Last Kbd Macro)
: Control-X E executes the most recently defined keyboard macro. See section 22.8 [KBDMAC], page 119.

Control-X Q (^R Kbd Macro Query)
: Control-X Q in a keyboard macro can ask the user whether to continue or allow him to do some editing before continuing with the keyboard macro. See section 22.8 [KBDMAC], page 119.

M-X Name Kbd Macro
: M-X Name Kbd Macro gives a permanent name to the last keyboard macro defined. See section 22.8 [KBDMAC], page 119.

M-X View Kbd Macro
: M-X View Kbd Macro prints the definition of a keyboard macro. See section 22.8 [KBDMAC], page 119.

Mail

Control-X M (Send Mail)
: Comtrol-X M allows you to edit and send a message using your favorite mail-reading program. The default is MM. See section 6.5 [Mail], page 30.

Control-X R (Read Mail)
: Control-X R runs your choice of mail-reading program to read and edit your mail. The default is MM. See section 6.5 [Mail], page 30.

M-X Check Mail
: M-X Check Mail tells you whether you have any new mail to be read. See section 6.5 [Mail], page 30.

Minibuffer

Control-% (^R Replace String)
: Control-% invokes a minibuffer containing a call to Replace String. You fill in the arguments. See section 19 [Replace], page 83.

Meta-Altmode (^R Execute Minibuffer)
: Meta-Altmode invokes an empty minibuffer which you can fill in with a TECO program to be executed. See section 23 [Minibuffer], page 123.

Meta-% (^R Query Replace)
: Meta-% invokes a minibuffer containing a call to Query Replace. You fill in the arguments. See section 19 [Replace], page 83.

Control-X Altmode (^R Re-execute Minibuffer)
: Control-X Altmode re-executes a TECC program previously executed in the minibuffer. It can also re-execute an extended command. See section 23 [Minibuffer], page 123.

Catalog of Libraries

Libraries Used Explicitly

These are libraries which you must load with M-X Load Library♦<libname><cr> to use. If no cross-reference is given, the only documentation for the library is the self-documentation contained in it. Use M-X List Library♦<libname><cr> to print a brief description of each function in the library For more detailed information, load the library and use M-X Describe on individual functions.

ABSTR — contains commands for making documentation files: wall charts, and abstracts of libraries. See the file INFO:CONV.INFO.

AUTO-SAVE-MODE — is an alternate implementation of Auto Save mode. It has some features which the standard version lacks, and lacks some which the standard version has.

BABYL — is a subsystem for reading, sending and editing mail. See the file INFO:BABYL.INFO.

BABYLV — is a library for converting between different Babyl file formats.

BBNLIB — contains a few commands that people at BBN like.

BCPL — implements BCPL mode.

BLISS — implements BLISS mode.

CACHE — implements a cache for speeding up EMACS subroutine calls.

CHESS — implements commands for editing pictures of chessboards.

COLUMNS — implements commands for converting single-column text into double-column text and vice versa.

DELIM — implements commands for moving over balanced groupings of various kinds of parentheses. There are a pair of commands for square brackets, a pair for angle brackets, etc.

DM — redefines commands to be convenient on Datamedia 2500 terminals.

DM3025 — redefines commands to be convenient on Datamedia 3025 terminals.

DOCOND — is a macro processor and conditionalizer for text files, useful for maintaining multiple versions of documents with one source.

EAKMACS — EAK's personal library, useful as an example.

EFORK — implements commands for running other programs in separate forks inferior to EMACS.

FIXLIB — functions for examining and patching EMACS functions.

FORTRAN — implements FORTRAN mode. See the file INFO:EFORTRAN.INFO.

HAZ1510 — redefines commands to be convenient on Hazeltine 1510 terminals.

INFO — peruses tree-structured documentation files.

INTER — is the EMACS side of the EMACS-to-Interlisp interface. See the file INFO:INTER.INFO.

IVORY — is EAK and ECC's alternate generator for EMACS libraries, which uses a slightly nonstandard input format. The libraries AUTO-SAVE-MODE, BABYL, BABYLM, BABYLV, CACHE, EAKMACS, FIXLIB, IVORY, LONG-FILENAMES, MKDUMP, OUTLINE-MODE, PL1, TEACH-C100, TMACS and WORDAB are generated with IVORY.

JOURNAL — implements journal files. See section 24.4 [Journals], page 129.

LEDIT — is the EMACS side of the EMACS-to-MacLisp interface. See the file INFO:LEDIT.INFO.

LONG-FILENAMES — provides help in handling files which have long names (on Twenex). It implements a different type of filename completion than the standard GTJFN system call.

LSPUTL — contains a couple of useful functions for searching and manipulating Lisp code.

LUNAR — is Moon's personal library, which contains some useful commands.

MACCNV — does part of the work of converting MACRO-10 code to MIDAS code.

MAICHK — checks for arrival of mail. If this library is loaded, EMACS will check frequently and automatically for new mail and notify you when any arrives.

MAZLIB — is a game for solving mazes. It's fun to play.

MKDUMP — aids in dumping your own customized environment.

MODLIN — implements a fancier mode line display.

MQREPL — works with TAGS to perform several Query Replaces on each of the files in a tag table.

NVT100 — defines the arrow keys and numeric keypad of the VT-100 terminal to perform editing functions.

NVT52 — defines the arrow keys and numeric keypad of the VT-52 terminal to perform editing functions.

OUTLINE — implements Outline Mode, for editing outlines.

OUTLINE-MODE — implements a different flavor of Outline Mode.

PAGE — defines commands for viewing only one page of the file at a time. See section 18.1 [PAGE], page 80.

PASCAL	implements PASCAL mode. See the file INFO:EPASC.INFO.
PHRASE	has commands for moving over and killing phrases of text.
PICTURE	contains Edit Picture, the command for editing text pictures. See section 26 [PICTURE], page 143.
PL1	implements PL1 mode. See the file INFO:EPL1.INFO.
PURIFY	generates libraries from EMACS source files, and contains other functions useful for editing the source files. See the file INFO:CONV.INFO.
RENUM	renumbers figures, equations, theorems or chapters.
SAIL	implements SAIL mode.
SCRLN	contains alternative definitions of C-N and C-P which move by screen lines instead of by real lines.
SEND-MAIL	sends mail to another user.
SLOWLY	redefines commands and options to suit slow terminals.
SORT	implements the sorting commands.
SPLIT	contains the commands Split File and Unsplit File for breaking up large files into subfiles small enough to be edited. See section 24.2 [Split], page 126.
SYSTEM	implements various commands useful for communicating with the operating system.
TDEBUG	is a debugger for TECO programs. It displays the buffer in one window and the program in the other, while stepping by lines or setting breakpoints. See the file INFO:TDEBUG.INFO.
TEACH-C100	has commands to define the programmable function keys of the Concept-100 terminal.
TIME	causes the current time of day to be displayed in the mode line.
TMACS	contains miscellaneous useful functions
TVLIB	customizes EMACS to resemble TVEDIT.
VT100	defines the arrow keys and numeric keypad of the VT-100 terminal to move the cursor and supply numeric arguments.
VT52	defines the numeric keypad of the VT-52 terminal to supply numeric arguments.

Automatically Loaded Libraries

These are libraries which the user need not know about to use.

AUX	implements several commands described in the manual as part of the standard EMACS. Loaded automatically when needed.
BABYLM	contains the part of Babyl that implements mail sending.

BARE — contains the definitions of all built-in functions. These definitions are not needed for executing the built-in functions, only so that Help can describe them properly. Loaded automatically by documentation commands when needed. See section 5.2 [BARE], page 22.

DIRED — implements the commands for editing and listing directories. Loaded automatically when needed. See section 13.6 [DIRED], page 62.

EINIT — is used in building and dumping EMACS. See the file INFO:CONV.INFO.

EMACS — is the main body of standard EMACS. Always loaded.

GRIND — implements C-M-G. Loaded automatically when needed. See section 20.6 [Grinding], page 95.

KBDMAC — implements keyboard macros. Loaded automatically when needed. See section 22.8 [Keyboard Macros], page 119.

MMAIL — interfaces between EMACS and a superior MM fork. Loaded automatically if needed.

TAGS — implements the TAGS package. See section 21 [TAGS], page 99.

TEX — implements TEX mode. See the file INFO:ETEX.INFO.

TRMTYP — implements the Set Terminal Type command. Loaded automatically when needed.

TWENEX — holds commands for the Twenex version of EMACS only. Always loaded.

WORDAB — implements Word Abbrev mode, loaded automatically when needed. See section 25 [WORDAB], page 135.

Index of Variables

An option is a variable whose value Edit Options offers for editing. A hook variable is a variable which is normally not defined, but which you can define if you wish for customization. Most hook variables require TECO programs as their values.

The default value of the variable is given in parentheses after its name. If no value is given, the default value is zero. If the word "nonexistent" appears, then the variable does not exist unless you create it.

Abort Resumption Message
This is the message to be printed by C-] to tell you how to resume the aborted command. If this variable is zero, there is no way to resume, so C-] asks for confirmation. See section 24.1 [Quitting], page 125.

Additional Abbrev Expanders (nonexistent)
If this variable exists when Word Abbrev mode is turned on, it is a string of characters which should terminate and expand an abbrev, in addition to the punctuation characters which normally do so. See also WORDAB Ins Chars.

Atom Word Mode The minor mode Atom Word mode is on if this variable is nonzero. See section 22.1 [Minor Modes], page 107.

Auto Directory Display
If this is nonzero, certain file operations automatically display the file directory. See section 13.4 [Directories], page 61.

Auto Fill Mode The minor mode Auto Fill mode is on if this variable is nonzero. See section 11.4 [Filling], page 50.

Auto Push Point Notification
The value of this variable is the string printed in the echo area by some commands to notify you that the mark has been set to the old location of point. See section 10 [Search], page 43.

Auto Push Point Option (500)
Searches set the mark if they move at least this many characters. See section 10 [Search], page 43.

Auto Save Default The minor mode Auto Save mode is on by default for newly visited files if this variable is nonzero. See section 13.3 [Auto Save], page 59.

Auto Save Filenames (<working directory>_^RSV..)
These are the filenames used for auto saving if the visited filenames are not used. See section 13.3 [Auto Save], page 59.

Auto Save Interval (500)

This is the number of characters between auto saves. See section 13.3 [Auto Save], page 59.

Auto Save Max (2) This is the maximum number of auto saves to keep. See section 13.3 [Auto Save], page 59.

Auto Save Visited File
If this is nonzero, auto saving saves as the visited filenames. If this is zero, auto saving saves as the names which are the value of Auto Save Filenames (q.v.). See section 13.3 [Auto Save], page 59.

Autoarg Mode When Autoarg Mode is nonzero, numeric arguments can be specified just by typing the digits. See section 4 [Arguments], page 17.

Buffer Creation Hook (nonexistent)
If this variable exists, its value should be a TECO program to be executed whenever a newly created buffer is selected for the first time. See section 14 [Buffers], page 67.

Buffer Deselection Hook (nonexistent)
If this variable exists, its value should be a TECO program to be executed whenever a buffer is about to be deselected. The difference between this and Buffer Selection Hook is that, while both are executed (if they exist) when you switch buffers, this is executed before the switch, and Buffer Selection Hook is executed after the switch. See section 14 [Buffers], page 67.

Buffer Selection Hook (nonexistent)
If this variable exists, its value should be a TECO program to be executed whenever a buffer is selected. See section 14 [Buffers], page 67.

Case Replace (1) When Case Replace is nonzero, Replace String and Query Replace attempt to preserve case when they replace. See section 19 [Replace], page 83.

Collapse in Comparison (nonexistent)
If this variable exists and is not zero, it should be a string of characters for M-X Window SRCCOM to regard as insignificant. See section 16 [Windows], page 73.

Comment Begin This is the string used to start new comments. If it is zero, the value of Comment Start is used. See section 20.4 [Comments], page 90.

Comment Column This is the column at which comments are aligned. See section 20.4 [Comments], page 90.

Comment End This is the string which is used to end comments. It is often empty for languages in which comments end at the end of the line. See section 20.4 [Comments], page 90.

Comment Multi Line (nonexistent)
If this variable exists and is nonzero, then when Auto Fill mode breaks a comment line, it does not insert a new comment starter on the new line. This is for use with languages that have explicit comment terminators, if you want single multi-line comments

instead of single-line comments on consecutive lines. See section 20.4 [Comments], page 90.

Comment Rounding (/8+1*8)
This is the TECO program used to decide what column to start a comment in when the text of the line goes past the comment column. The argument to the program is the column at which text ends. See section 20.4 [Comments], page 90.

Comment Start This is the string used for recognizing existing comments, and for starting new ones if Comment Begin is zero. If Comment Start is zero, semicolon is used. See section 20.4 [Comments], page 90.

Default Major Mode (Fundamental)
This is the major mode in which new buffers are created. If it is the null string, new buffers are created in the same mode as the previously selected buffer. See section 14 [Buffers], page 67.

Directory Lister (& Subset Directory Listing)
This is the TECO program used for listing a directory for C-X C-D and the Auto Directory Display option. The default value is the definition of the function & Subset Directory Listing. See section 13.4 [Directories], page 61.

Display Matching Paren (-1)
This variable controls automatic display of the matching open parenthesis when a close parenthesis is inserted. See section 20.3 [Matching], page 89.

EMACS Version This variable's value is the EMACS version number.

EXEC Name (nonexistent)
If this variable exists, its value, if nonzero, is the filename of the program to be used by M-X Push to EXEC to serve as the EXEC. See section 6.4 [Subforks], page 27.

Exit Hook (nonexistent)
If this variable exists, its value should be a TECO program to be executed whenever EMACS is exited. The subroutine & Exit EMACS is responsible for executing it. See section 6.3 [Exiting], page 27.

Fill Column (70) The value of Fill Column is the width used for filling text. See section 11.4 [Filling], page 50.

Fill Extra Space List (.?!)
The characters in this string are the ones which ought to be followed by two spaces when text is filled. See section 11.4 [Filling], page 50.

Fill Prefix The value of this variable is the prefix expected on every line of text before filling and placed at the front of every line after filling. It is usually empty, for filling nonindented text. See section 11.4 [Filling], page 50.

Find File Inhibit Write
If this variable is nonzero, then C-X C-F visits files in read-only (C-X C-R) fashion. Normally, C-X C-F visits files in [illegible] were being used. See section 14 [Buffers], page [illegible]

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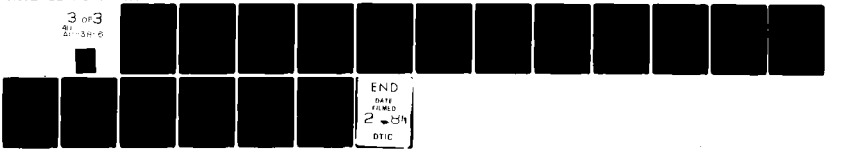
EMACS MANUAL FOR TWENEX USERS.(U)
SEP 80 R M STALLMAN N00014-75-C-0643
UNCLASSIFIED AI-M-555 NL



END
DATE FILMED
2 -84
DTIC

Indent Tabs Mode (-1)
: If Indent Tabs Mode is nonzero, then tab characters are used by the indent commands. Otherwise, only spaces are used. See section 11.3 [Indenting Text], page 48.

Inhibit Write
: If Inhibit Write is nonzero, then there will be no offer to save the visited file if another file is visited in the same buffer. C-X C-R sets this variable nonzero. See section 13.1 [Visiting], page 57.

<libname> Setup Hook (nonexistent)
: If this variable exists, its value should be a TECO program to be executed when the library <libname> is loaded. The library's & Setup function is responsible for doing this. If the library has no & Setup function, it will not handle a setup hook either. See section 22.2 [Libraries], page 108.

Mail Reader Library (nonexistent)
: If this variable exists, it is the name of the library to be used by M-X Read Mail for reading mail and by M-X Send Mail for sending mail. The former calls the function "<entry>" in the library, and the latter calls the function "& Mail Message". . See section 6.5 [Mail], page 30.

Mail Reader Program (nonexistent)
: If this variable exists (and Mail Reader Library does not), it is the name of the the program to be used for reading and sending mail. See section 6.5 [Mail], page 30.

<mode> ..D (nonexistent)
: This variable is used by the major mode <mode> to record the syntax table for that mode. It is created by the first use of the mode, and if you supply your value, that value will be accepted instead. For example, Text mode uses Text ..D. Not all major modes have their own syntax tables. See section 22.4 [Syntax], page 111.

<mode> Mode Hook (nonexistent)
: If this variable exists, its value should be a TECO program to be executed when the major mode <mode> is entered. For example, Text Mode Hook is executed when Text mode is entered. See section 20.1 [Major Modes], page 87.

Next Screen Context Lines (nonexistent)
: If this variable exists, its value specifies the number of lines of overlap between one screenful and the next, when scrolling by screens with C-V and M-V. See section 15 [Display], page 71.

Only Global Abbrevs (nonexistent)
: If this variable exists and its value is nonzero, then Word Abbrev Mode assumes that you are not using any mode-specific abbrevs. See section 25.2.1 [Customizing WORDAB], page 139.

Overwrite Mode
: If this is nonzero, the minor mode Overwrite mode is in effect. See section 22.1 [Minor Modes], page 107.

Page Delimiter (↑L)
: This is the TECO search string used to recognize page boundaries. See section 18 [Pages], page 79.

PAGE Flush CRLF If this variable exists and is nonzero, the PAGE library expects every page to start with a blank line, which is not considered part of the contents of the page. See section 18.1 [PAGE], page 80.

Paragraph Delimiter (.↑O↑I↑O ↑O')
This is the TECO search string used to recognize beginnings of paragraphs. See section 11.2 [Sentences], page 47.

Permit Unmatched Paren (-1)
Controls whether the bell is run if you insert an unmatched close parenthesis. See section 20.3 [Matching], page 89.

Read Line Delay This is the amount of time, in 30'ths of a second, which EMACS should wait after starting to read a line of input, before it prompts and starts echoing the input.

Region Query Size (5000)
Many commands which act on the region require confirmation if the region contains more than this many characters. See section 8 [Mark], page 33.

Return from Superior Hook (nonexistent)
If this variable exists, its value should be a TECO program to be executed whenever EMACS is resumed after being exited. See section 6.3 [Exiting], page 27.

Set Mode Line Hook
This is a hook which is executed every time the mode line is recomputed. It can insert text in the buffer to put it in the mode line after the minor modes. See section 1.1 [Mode Line], page 6.

SLOWLY Maximum Speed (nonexistent)
If this variable is defined, it is the maximum output speed for which SLOWLY, if loaded, should define its commands.

Space Indent Flag If this flag is nonzero, then Auto Fill indents the new lines which it creates, by performing a Tab. Most major modes for programming languages set this nonzero. See section 11.4 [Filling], page 50.

Tab Stop Definitions (a string)
The value of Tab Stop Definitions is a string defining the tab stops to be used by the command M-I (^R Tab to Tab Stop). See section 11.3 [Indenting Text], page 48.

Tags Find File (nonexistent)
If this variable exists and is not zero, TAGS uses C-X C-F to switch files. Otherwise, TAGS uses C-X C-V. See section 21 [TAGS], page 99. Some other things may decide to use multiple buffers if this variable is nonzero. See section 14 [Buffers], page 67.

Tags Search Verbose (nonexistent)
If this variable exists and is zero, Tags Search does not print out the name of each file that it begins to earch. If the variable is nonexistent, that is equivalent to a value of 1. See section 21.4.3 [Tags Search], page 103.

Temp File FN2 List (MEMO↑OXGP↑O ...) This is a TECO search string which recognizes the filenames which indicate that the file is probably temporary. See section 13.5 [Clean Directory], page 61.

Visit File Hook (nonexistent)
: If this variable exists, its value should be a TECO program to be executed whenever a file is visited. See section 13.1 [Visiting], page 57.

WORDAB Ins Chars (nonexistent)
: If this variable exists when Word Abbrev Mode is turned on, it should be a string containing precisely those characters which should terminate and expand an abbrev. This variable overrides Additional Abbrev Expanders (q.v.). See section 25.2.1 [Customizing WORDAB], page 139.

Non-Control Non-Meta Characters:

```
Backspace ^R Backward Character
Tab       ^R Indent According to Mode
Linefeed  ^R Indent New Line
Return    ^R CRLF
Altmode   ^R Prefix Meta
Rubout    ^R Backward Delete Character
```

Control Characters:

```
Altmode   ^R Exit
Space     ^R Set/Pop Mark
%    ..   ^R Replace String
-    ..   ^R Negative Argument
0 thru 9  ^R Argument Digit
;    ..   ^R Indent for Comment
<    ..   ^R Mark Beginning
=    ..   What Cursor Position
>    ..   ^R Mark End
@    ..   ^R Set/Pop Mark
A    ..   ^R Beginning of Line
B    ..   ^R Backward Character
C    ..   ^R Exit to Exec
D    ..   ^R Delete Character
E    ..   ^R End of Line
F    ..   ^R Forward Character
G    ..   ^R Quit
H    ..   ^R Backward Character
I    ..   ^R Indent According to Mode
J    ..   ^R Indent New Line
K    ..   ^R Kill Line
L    ..   ^R New Window
N    ..   ^R Down Real Line
O    ..   ^R Open Line
P    ..   ^R Up Real Line
Q    ..   ^R Quoted Insert
R    ..   ^R Reverse Search
S    ..   ^R Incremental Search
T    ..   ^R Transpose Characters
U    ..   ^R Universal Argument
V    ..   ^R Next Screen
W    ..   ^R Kill Region
X    ..   is a prefix character.  See below.
Y    ..   ^R Un-kill
Z    ..   ^R Prefix Control-Meta
\    ..   ^R Prefix Meta
]    ..   Abort Recursive Edit
^    ..   ^R Prefix Control
Rubout    ^R Backward Delete Hacking Tabs
```

Meta Characters:

Linefeed	^R Indent New Comment Line
Return	^R Back to Indentation
Altmode	^R Execute Minibuffer
# ..	^R Change Font Word
% ..	^R Query Replace
' ..	^R Upcase Digit
(..	^R Make ()
) ..	^R Move Over)
- ..	^R Negative Argument
. ..	^R Find Tag
/ ..	^R Describe
0 thru 9	^R Argument Digit
; ..	^R Indent for Comment
< ..	^R Goto Beginning
= ..	^R Count Lines Region
> ..	^R Goto End
? ..	^R Describe
@ ..	^R Mark Word
A ..	^R Backward Sentence
B ..	^R Backward Word
C ..	^R Uppercase Initial
D ..	^R Kill Word
E ..	^R Forward Sentence
F ..	^R Forward Word
G ..	^R Fill Region
H ..	^R Mark Paragraph
I ..	^R Tab to Tab Stop
J ..	^R Indent New Comment Line
K ..	^R Kill Sentence
L ..	^R Lowercase Word
M ..	^R Back to Indentation
N ..	^R Down Comment Line
P ..	^R Up Comment Line
Q ..	^R Fill Paragraph
R ..	^R Move to Screen Edge
S ..	^R Center Line
T ..	^R Transpose Words
U ..	^R Uppercase Word
V ..	^R Previous Screen
W ..	^R Copy Region
X ..	^R Extended Command
Y ..	^R Un-kill Pop
[..	^R Backward Paragraph
\ ..	^R Delete Horizontal Space
] ..	^R Forward Paragraph
^ ..	^R Delete Indentation
_ ..	^R Underline Word
~ ..	^R Buffer Not Modified
Rubout	^R Backward Kill Word

Control-Meta Characters:

```
Backspace ^R Mark Defun
Tab       ^R Indent for LISP
Linefeed  ^R Indent New Comment Line
Return    ^R Back to Indentation
(     ..  ^R Backward Up List
)     ..  ^R Forward Up List
-     ..  ^R Negative Argument
0 thru 9  ^R Argument Digit
:     ..  ^R Kill Comment
?     ..  ^R Documentation
@     ..  ^R Mark Sexp
A     ..  ^R Beginning of DEFUN
B     ..  ^R Backward Sexp
D     ..  ^R Down List
E     ..  ^R End of DEFUN
F     ..  ^R Forward Sexp
G     ..  ^R Format Code
H     ..  ^R Mark Defun
I     ..  ^R Indent for LISP
J     ..  ^R Indent New Comment Line
K     ..  ^R Kill Sexp
M     ..  ^R Back to Indentation
N     ..  ^R Forward List
O     ..  ^R Split Line
P     ..  ^R Backward List
Q     ..  ^R Indent SEXP
R     ..  ^R Reposition Window
T     ..  ^R Transpose Sexps
U     ..  ^R Backward Up List
V     ..  ^R Scroll Other Window
W     ..  ^R Append Next Kill
X     ..  ^R Instant Extended Command
Z     ..  ^R Exit
[     ..  ^R Beginning of DEFUN
\     ..  ^R Indent Region
]     ..  ^R End of DEFUN
^     ..  ^R Delete Indentation
Rubout    ^R Backward Kill Sexp
```

Control-X is an escape prefix command with these subcommands:

```
^X ^B       List Buffers
^X ^D       ^R Directory Display
^X ^F       Find File
^X Tab      ^R Indent Rigidly
^X ^L       ^R Lowercase Region
^X ^N       ^R Set Goal Column
^X ^O       ^R Delete Blank Lines
^X ^P       ^R Mark Page
^X ^Q       ^R Do Not Write File
^X ^R       ^R Read File
^X ^S       ^R Save File
^X ^T       ^R Transpose Lines
^X ^U       ^R Uppercase Region
^X ^V       ^R Visit File
^X ^W       Write File
^X ^X       ^R Exchange Point and Mark
^X ^Z       ^R Return to Superior
^X Altmode  ^R Re-execute Minibuffer
^X #        ^R Change Font Region
^X (        ^R Start Kbd Macro
^X .        ^R Set Fill Prefix
^X 1        ^R One Window
^X 2        ^R Two Windows
^X 3        ^R View Two Windows
^X 4        ^R Visit in Other Window
^X ;        ^R Set Comment Column
^X =        What Cursor Position
^X A        ^R Append to Buffer
^X B        Select Buffer
^X D        ^R Dired
^X F        ^R Set Fill Column
^X G        ^R Get Q-reg
^X H        ^R Mark Whole Buffer
^X I        ^R Info
^X K        Kill Buffer
^X L        ^R Count Lines Page
^X M        Send Mail
^X N        ^R Set Bounds Region
^X O        ^R Other Window
^X P        ^R Set Bounds Page
^X R        Read Mail
^X T        ^R Transpose Regions
^X W        ^R Set Bounds Full
^X X        ^R Put Q-reg
^X [        ^R Previous Page
^X ]        ^R Next Page
^X ^        ^R Grow Window
^X _        ^R Underline Region
^X Rubout   ^R Backward Kill Sentence
```

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